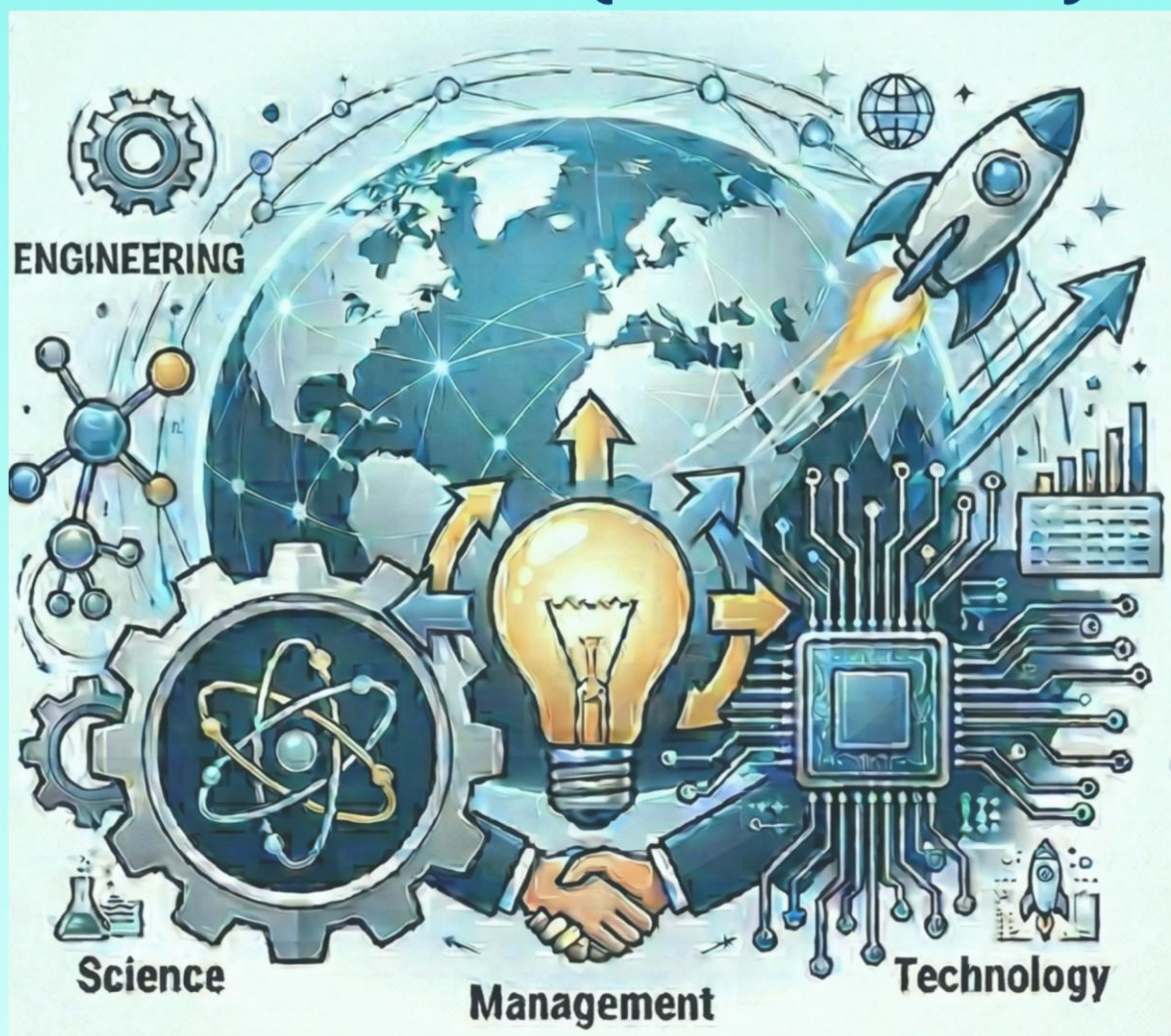




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PROCEEDINGS OF THE SECOND INTERNATIONAL CONFERENCE ON “MODERN TRENDS IN ENGINEERING, SCIENCE, MANAGEMENT, AND TECHNOLOGY” (MESMT - 2026)



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Chief Editor

Mrs. C. Angel Sarojini

Associate Editors

Dr. T. Lurthu Pushparaj

Dr . M. Appadurai

Proceedings of Second International Conference on “Modern Trends in Engineering, Science, Management, And Technology” – MESMT 2026

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FOREWORD

I am pleased to extend my heartfelt greetings on the occasion of the International Conference on “**Modern Trends in Engineering, Science, Management, and Technology (MESMT–2026)**”, organized by the **PG & Research Department of Chemistry, T.D.M.N.S. College, T. Kallikulam**, in collaboration with the **Xavier Institute for Research and Development (XIRD)**, a research institute registered under MSME, on **21st and 22nd March 2026**. This academic initiative reflects the institution’s continued commitment to the advancement of scientific knowledge and the promotion of sustainable development. At a time when the global community is striving to address emerging challenges and opportunities in Engineering, Science, Management, and Technology, such scholarly gatherings provide an important platform for intellectual exchange, innovation, and collaboration among researchers, academicians, and industry experts. I commend the organizing committee for their vision, dedication, and tireless efforts in bringing together distinguished scholars and professionals from diverse fields. I am confident that the discussions and insights emerging from this conference will contribute significantly to academic excellence, interdisciplinary collaboration, and the pursuit of sustainable solutions for the future. I wish the conference great success and hope it will have a lasting and meaningful impact on the scientific and academic community.

With best wishes,



Dr. T. Nirmala
Principal (i/c)

PREFACE

It is with great pride and academic fervor that we present the proceedings of the **International Conference on Modern Trends in Engineering, Science, Management, and Technology (MESMT – 2026)**. Held virtually on **March 21 & 22, 2026**, this online conference stands as a testament to the power of collaborative intellect and the relentless pursuit of innovation in a rapidly evolving global landscape.

Jointly organized by **Tirunelveli Dakshina Mara Nadar Sangam College** (an NAAC “A” Grade Accredited Institution, aided by the Govt. of Tamil Nadu) and the **Xavier Institute for Research and Development (XIRD)** (an MSME-registered, ISO 9001:2015 Certified EduTech & Research Institute), MESMT-2026 was envisioned as a premier multidisciplinary platform. The event successfully brought together a diverse cohort of UG and PG students, research scholars, esteemed faculty members, and industrial personnel to deliberate on the transformative advancements defining our future.

The overwhelming response to this conference underscores the vibrancy of the global research community. Out of a vast number of submissions, **more than 680 articles** were selected and presented. The research shared during these two days spanned a comprehensive array of disciplines, meticulously organized into three primary tracks:

Track 1 - Engineering & Technology

- Computer Science & Information Technology
- Artificial Science, Data Science & Cyber Security
- Electrical, Electronics, Communication & Instrumentation Engineering
- Mechanical, Mechatronics, Thermal & Automobile Engineering
- Civil, Industrial, Chemical, Biotech & Biomedical Engineering

Track 2 - Arts & Science

- Chemical, Physical, Life, and Social Sciences
- Earth Science & Informatics
- Mathematics, Statistics & Environmental Science
- Computer Related Studies & Commerce

Track 3 - Agriculture & Management

- Finance, Marketing & Entrepreneurship
- Logistics, E-Commerce, Foreign Trade & Business Economics
- Modern Trends in Agriculture, Botany & Zoology

Each contribution underwent a rigorous review process to ensure high academic standards. Reflecting our commitment to disseminating impactful research, accepted works are being provided diverse publication avenues, ranging from abstract proceedings and ISBN book chapters to esteemed Google Scholar, Scopus, and SCI-indexed journals, including publications with Springer and Taylor & Francis.

We extend our deepest gratitude to our Event Coordinators,

Dr. T. Lurthu Pushparaj and **Mrs. Angel Sarojini**, whose dedicated leadership and tireless efforts were instrumental in making this grand online event a reality. We also sincerely thank the keynote speakers for their visionary insights, the session chairs for their expert moderation, the authors for sharing their pioneering work, and the supporting staff of both host institutions.

We trust that these proceedings will serve as a valuable resource for researchers and practitioners alike, sparking new ideas and fostering future collaborations that will continue to push the boundaries of multidisciplinary science and technology.

Editorial Board
MESMT – 2026

ACKNOWLEDGEMENTS

The successful culmination of the **International Conference on Modern Trends in Engineering, Science, Management, and Technology (MESMT – 2026)** is the result of immense dedication, collaborative spirit, and unwavering support from numerous individuals and institutions. As the Academic Director of the Xavier Institute for Research and Development (XIRD), I extend my most profound gratitude to everyone who contributed to making this two-day virtual symposium a resounding success.

First and foremost, my sincere thanks go to our esteemed partner institution, **Tirunelveli Dakshina Mara Nadar Sangam College**. The seamless collaboration between our organizations was the cornerstone of this event. I am deeply grateful to the college's Management, Principal, and faculty for their continuous support and shared vision. A special note of appreciation is reserved for my Co-Event Coordinator, **Dr. T. Lurthu Pushparaj**, whose tireless efforts, organizational acumen, and exceptional teamwork were vital in coordinating a conference of this magnitude.

I would also like to express my heartfelt gratitude to the leadership at XIRD, particularly our Director, **Dr. E. Fantin Irudaya Raj**, for his visionary guidance, constant encouragement, and commitment to fostering multidisciplinary research platforms.

An event of this scale—featuring over 680 presented articles—would not be possible without the intellectual contributions of our participants. I extend my warmest thanks to our distinguished keynote speakers for setting a high academic standard with their profound insights. I am equally grateful to the session chairs, the

technical review committee, and the editorial board for their meticulous evaluation and commitment to academic excellence.

To the researchers, faculty members, industry professionals, and students who submitted and presented their pioneering work: thank you. Your enthusiasm and dedication to advancing the fields of Engineering, Arts, Science, Agriculture, and Management are the true driving forces behind MESMT-2026.

Finally, I want to acknowledge the dedicated technical and support staff at XIRD and TDMN Sangam College. Managing an online platform for such a vast and diverse cohort required exceptional coordination, and your behind-the-scenes work ensured a flawless experience for all attendees.

Thank you all for your belief in our mission and for contributing to the advancement of global scientific and technological discourse.

Mrs. Angel Sarojini

Academic Director

Xavier Institute for Research and Development (XIRD)

India

About the Editors



Mrs. C. Angel Sarojini serves as the Academic Director at the Xavier Institute for Research and Development, where she oversees institutional growth and technical innovation. An M.Sc. in Mathematics (Distinction) and B.Ed. graduate, she possesses over four years of multifaceted teaching experience spanning primary to postgraduate levels. Transitioning from a high-performing background in Computer Science to executive leadership, Mrs. Sarojini combines technical proficiency in programming and database management with current research in **Big Data, AI, and Cloud Computing**. Her unique ability to blend pedagogical expertise with emerging technologies provides a strategic and comprehensive perspective on modern higher education administration.

Dr. T. Lurthu Pushparaj is an accomplished academic and researcher with 13 years of teaching experience and one year of industrial experience. He currently serves as an Assistant Professor of Chemistry at T.D.M.N.S College, having previously held the position of Associate Professor and Head of the Chemistry Department at Einstein College of Engineering. He earned his Ph.D. in Chemistry from the University of Madras in 2011, with his thesis focusing on the synthesis of Gadolinium complexes as contrast-enhancing agents for Magnetic Resonance Imaging. A recognized Ph.D. supervisor under Manonmaniam Sundaranar University, his research portfolio includes an h-index of 8, an i10-index of 7, and 338 citations. Dr. Pushparaj has an extensive publication record, encompassing 17 SCI-indexed and 19 ISI-indexed journal articles, 5 book chapters, and two patents, including a granted Australian patent for a machine learning-based health prediction model. Furthermore, he has successfully completed several funded research projects, most notably a Rs. 19.08 lakh DST-SERB project focused on developing multimodal imaging agents for cancer treatment.



Dr. M. Appadurai holds a Ph.D. in Mechanical Engineering from Anna University, Chennai, complemented by an M.E. in Engineering Design. With **12 years of academic experience**, he currently serves as an Assistant Professor at Dr. Sivanthi Aditanar College of Engineering, following a five-year tenure at Infant Jesus College of Engineering and Technology. A dedicated researcher, Dr. Appadurai has extensively published books, chapters, and articles in prestigious national and international journals. His core research and professional interests include **Solar Energy, Composite Materials, Finite Element Analysis (FEA), and Hybrid Electric Vehicles.**

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Paper Id: A001

Advanced Forensic Investigation of Bitcoin Transaction Network Using Cache Based Pattern Matching Rules

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Abstract

As more of the world comes on board with the use of cryptocurrencies, Bitcoin is still one of the most popular digital assets by usage and volume of transactions. As this demand keeps growing, more effective ways to observe and analyze transaction patterns are needed. The conventional analytical methods do not perform well when applied to the size and nature of blockchain data. This research introduces a new method for building a Bitcoin Transaction Network (BTN) based on Pattern Matching Rules (PMR) to better detect suspicious or illegal behavior. Cleaning and preprocessing blockchain forensic data is initiated with the removal of incomplete entries as well as irrelevant symbols. Core transaction characteristics—like timestamps, transaction identifiers, hash rate measurements, and error logs—are pulled out by a Petri-Net model technique to create the core structure of the BTN. PMR logic is then applied to track and analyze transaction addresses in the past to compare them with known patterns of fraudulent or spam-related activity. This ordered, rule-governed analysis not only enhances detection performance but also increases transparency and traceability in the Bitcoin network, allowing for better visualization and comprehension of intricate transaction streams.

Keywords: Bitcoin Transaction Network (BTN) – Pattern Matching Rules (PMR) – Blockchain Analysis – Petri-Net Framework

Paper ID: A002

**PERFORMANCE ENHANCEMENT OF A PV – BATTERY
HYBRID CONVERTER USING ACTIVE RECTIFICATION
AND DUAL ACTIVE BRIDGE TOPOLOGY**

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ABSTRACT — This paper presents a modified photovoltaic (PV) – battery hybrid distributed power generation system by replacing the conventional diode rectifier on the secondary side of the high-frequency transformer with a full-bridge voltage source converter (VSC). The proposed modification transforms the originally unidirectional isolated DC–DC converter into a Dual Active Bridge (DAB) topology, enabling fully bidirectional power flow between the PV source, battery energy storage system, and DC bus. By employing phase-shift modulation between the primary and secondary active bridges, controlled power transfer is achieved without the need for additional bidirectional DC–DC stages. The active rectification significantly reduces conduction losses, improves conversion efficiency, and allows regenerative power flow from the DC bus to the battery. A closed-loop control strategy incorporating DC bus voltage regulation and constant current–constant voltage (CC–CV) battery charging is developed to ensure effective energy management under varying load and irradiation conditions. The proposed system is modeled and simulated in MATLAB/Simulink, and the results demonstrate stable DC bus voltage regulation, smooth bidirectional power control, and enhanced system flexibility compared to the conventional diode-rectified topology. The DAB-based architecture is well suited for renewable energy integration, DC microgrids, and electric vehicle charging applications.

KEYWORDS — Dual Active Bridge, Active Rectification, Controller, Power LED, PCB Board, Solar Panel, Resistor, Capacitor, Rectifier.

Paper Id: A003

Secure and Auditable AI Architectures for Regulated Industries

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Abstract

Artificial Intelligence (AI) applications are being implemented in some of the most controlled fields like healthcare, finance, energy, and public administration. Although AI provides automation, predictive intelligence, and operational efficiency, its use on regulated environments presents great challenges in the area of security, auditability, explainability, and compliance. The traditional AI pipelines focus on such performance measures as accuracy, latency, neglecting the governance goals, like traceability, data provenance, model integrity, and regulatory reporting. The paper suggests a safe and audit-able AI architecture that targets regulated industries and incorporates zero-trust security principles, cryptographic integrity solutions, explainable AI (XAI), constant compliance verification, and blockchain audit trails.

The suggested architecture follows a hierarchy of defense-in-depth strategy which consists of secure data ingestion, encrypted model training pipelines, tamper evident logs, federated governance modules and automated compliance verification engines. A test implementation is tested in both simulated healthcare and financial applications to check performance overhead, compliance assurance and attack resistance. The experimental findings indicate that the architecture can improve transparency and regulatory preparedness at little computational cost (8-14% rise in latency) and would greatly improve traceability and adversarial resiliency. The research adds a detailed blueprint of architecture and appraisal framework, which seals the divide between AI innovation and regulatory responsibility.

Keywords: AI governance, auditable AI systems, compliance engineering, explainable artificial intelligence, secure AI architecture

Paper ID: A004

Technology-Driven Sustainable Development and its Influence on Green Consumer Behaviour: An Empirical Study

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Abstract: Technology-driven solutions are transforming how individuals and societies engage with sustainability, yet their influence on green consumer behaviour remains unevenly understood. This study investigates the impact of digital technologies, such as mobile applications, e-commerce platforms, and smart devices, on consumers' environmentally responsible attitudes, intentions, and purchase decisions. The research examines how perceived usefulness, ease of use, and trust in technology-enabled sustainability initiatives shape green purchasing behaviour and readiness to pay for eco-friendly products. Using an empirical design based on a structured questionnaire, data are collected from consumers exposed to technology-mediated sustainability information and tools, and analysed through appropriate statistical techniques to test the proposed relationships. The findings are expected to highlight the mediating role of environmental awareness and perceived behavioural control in the link between technology-driven sustainable development initiatives and green consumer behaviour. The study contributes to theory by integrating perspectives from sustainable development, technology adoption, and consumer behaviour, and offers practical insights for policymakers, businesses, and digital platform designers seeking to leverage technology for promoting responsible consumption patterns.

Keywords: Technology-driven sustainability, green consumer behaviour, Digital transformation, Sustainable development, Empirical study

Paper Id: A005

PRECISION AGRICULTURE THROUGH EXPLAINABLE NN-BASED CROP DISEASE PREDICTION

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Abstract:

In response to the challenge faced by traditional convolutional neural networks (CNNs) in effectively capturing the posture and spatial relationships of plant disease lesions on leaves, which leads to low recognition accuracy and poor robustness, this paper proposes an innovative method for plant leaf disease image classification by integrating capsule networks (CapsNet) and residual networks (ResNet). Capsule networks, designed to recognize spatial hierarchies, are combined with residual networks, known for alleviating the vanishing gradient problem, to enhance both accuracy and robustness in plant disease identification. The model was trained and evaluated using diverse datasets, including Plant Village Data, AI Challenge Data, and Tomato Data. Various algorithms were implemented for classification tasks, including AlexNet, GoogleNet, VGG16, Xception, ResNet18, CapsNet, SE-ResNet, SK-ResNet, and SE-SK-CapsResNet. Additionally, the YOLO family of algorithms, including YOLO v5x6, YOLO v5s6, YOLO v8n, and YOLO v9n, was employed for detecting abnormalities in leaf images. Our proposed method demonstrates improved performance in accurately classifying and detecting plant leaf diseases, offering promising advancements for more reliable agricultural practices.

Index Terms - Plant Disease Detection, Deep Learning, Convolutional Neural Networks (CNNs), Capsule Networks (Capsnet), Attention Mechanisms, Residual Networks, Feature Extraction, Ensemble Learning, Hybrid Models, Agricultural Applications.

Paper Id: A006

AUTOMATED CRACK DETECTION ON BRIDGES USING YOLO

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ABSTRACT

In today's rapidly urbanizing world, the safety and maintenance of bridges have become a critical concern. Increasing traffic loads, aging infrastructure, and environmental factors such as temperature fluctuations, corrosion, and natural wear contribute significantly to the formation of cracks in bridge structures. Traditional methods of inspecting bridges rely heavily on manual observation by engineers, which is both time-consuming and labor-intensive. Inspectors often face safety risks when accessing large, elevated, or hard-to-reach sections of bridges, making frequent inspections difficult and sometimes hazardous. Moreover, manual inspection is prone to human error, leading to inconsistencies in identifying cracks and assessing their severity, which can delay maintenance and increase the likelihood of structural failure. To address these challenges, this project proposes an automated bridge crack detection and severity classification system using drone-based imaging combined with advanced image processing and deep learning techniques. The system employs the YOLO (You Only Look Once) algorithm to detect cracks in real time, while simultaneously classifying them into severity levels: normal, moderate, or severe. A user-friendly graphical interface presents the detection results along with severity information, enabling engineers to monitor bridge health efficiently. By automating the inspection process, the system reduces human intervention, improves accuracy, shortens inspection time, lowers maintenance costs, and ultimately enhances the safety and longevity of bridge structures.

Keywords: Image Processing, Deep Learning, YOLO,

Paper Id. A007

AI-DRIVEN SMART EXAM MONITORING

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Abstract

With the increasing shift to online education, especially after the COVID-19 pandemic, ensuring fairness during online exams has become a serious challenge. This project introduces an AI-powered smart exam monitoring system to improve the security and trust of remote assessments. Using a standard webcam and microphone, the system monitors the student's face, eye movements, mouth activity, and surroundings in real time. It can detect if the student is talking, frequently looking away, or using unauthorized items like mobile phones or books. Technologies like OpenCV, Dlib, and YOLO help with facial analysis and object detection, while audio analysis identifies suspicious conversations. The system can also detect if another person is present in the room. It aims to reduce the need for human invigilators. The system is cost-effective, easy to scale, and works on basic devices. It provides a practical solution for educational institutions to conduct secure, fair, and efficient online exams in the digital era.

Keywords—COVID-19 pandemic, remote learning, Microsoft Teams, academic continuity, online examinations, plagiarism, alternative assessment methods, examination integrity, AI- powered system, webcam monitoring

Paper Id: A008

A Privacy-Preserving Federated Learning Framework for Secure IoT Data Analytics

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Abstract

The rapid increase in Internet of Things (IoT) devices has resulted in the creation of large amounts of sensitive data at the edge of the network. Machine Learning (ML) is critical to the insight gained from these large volumes of data, however, the traditional centralized approach to ML presents serious privacy concerns as well as high communication overheads. Federated Learning (FL) solves these issues by allowing collaboration on the development of ML models without having to exchange the underlying raw data; however, FL is also vulnerable to poisoning attacks and inference threats and, furthermore, is typically too computationally demanding for IoT devices that are resource-limited. In this paper, we present a lightweight secure privacy-preserving version of FL that has been developed with IoT in mind. The proposed Lightweight Secure Federated Learning (LS-FL) incorporates Differential Privacy (DP) to protect data, the use of Elliptic Curve Cryptography (ECC) for secure data transmission, and a robust method for detecting malicious updates that uses cosine similarity analyses. The LS-FL framework is supported by both theoretical and experimental results on the Bot-IoT dataset demonstrating that it achieves greater than 95% accuracy for anomaly detection, while reducing communication overhead by 90% vs. a centralized ML approach. It effectively mitigated model poisoning attacks and retained model accuracy greater than 93% when 30% of its client base were malicious.

Keywords: Internet of Things, Federated Learning, Differential Privacy, Lightweight Cryptography, Secure Aggregation, Anomaly Detection, Edge Computing, Model Poisoning Defense.

Paper Id: A009

Smart Battery Bank with Integrated Battery Management System

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ABSTRACT: The increasing demand for reliable and efficient energy storage systems has led to the widespread adoption of lithium-ion batteries in portable and backup power applications. The project focuses on the design and development of a battery bank integrated with a Battery Management System (BMS) to ensure safe, efficient and reliable operation of lithium-ion battery packs. The proposed system monitors key battery parameters such as voltage, current and temperature while providing essential protection functions including over-charge, over-discharge, over-current and short-circuit protection. Cell balancing techniques are implemented. To maintain uniform voltage levels across battery cells, enhance performance and extend battery lifespan. The developed battery bank is designed to support low-voltage DC applications such as USB power output and portable energy storage solutions. Experimental Results demonstrate improved safety, stability, and efficiency compared to conventional battery Systems without BMS.

The proposed design offers a cost-effective and compact power bank solution for modern energy storage applications and portable electronics contributing to Sustainable and intelligent power management systems.

Keywords: BMS, Power Bank Module

Paper Id: A010

Extraction and Characterization of Plant-Based Biosurfactants for Environmental Sustainability

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Abstract

Interest in Plant-derived biosurfactants as an eco-friendly replacement for conventional synthetic surfactants has increased due to the increasing demand for environmentally sustainable surface-active agents. The extraction, physicochemical characterisation, and performance evaluation of biosurfactants generated by plant-based liquid, applying a green extraction technique, have been examined in this work. Crude biosurfactant extracts were obtained by ethanol - water extraction of fresh plant materials, subsequent to filtration, concentration, purification, and characterisation. The surface-active aspects of isolated compounds were evaluated by measuring the critical micelle concentration (CMC), lowering the surface activity, emulsification index (E24), the foam stability, pH, electrical conductivity, and viscosity. The presence of different functional groups has been established by Fourier Transform Infrared (FTIR) spectroscopy. The synthesized biosurfactants show significant properties to reduce surface activities and stable oil-water emulsification, indicating strong interaction with the hydrophobic phase. The plant-based biosurfactant revealed outstanding endurance in an extensive range of pH and saline conditions, highlighting its applicability for a variety of industrial and environmental applications. The results suggest that the plant-based fluids are an economical, environmentally friendly resource for the development of sustainable biosurfactants.

Keywords: Biosurfactant, CMC, E24, Oil remediation.

Paper Id: A011

An AI-Powered Chatbot for Automated E- Grievance Management

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ABSTRACT

Traditional grievance redressal systems are often inefficient, manual, and lack transparency, leading to significant delays and user frustration. To address these challenges, this project proposes the e-Grievance Portal using Chatbot, an intelligent, web-based platform designed to simplify and accelerate grievance management for citizens, employees, and students. The system integrates a multilingual AI-powered chatbot (supporting Tamil and English). The chatbot guides users through the complaint submission process, answers frequently asked questions, and delivers instant updates on complaint status, thereby enhancing accessibility for users with diverse linguistic backgrounds. The backend is developed using .NET Core, ensuring scalability, security, and role-based authentication, while the frontend is implemented with ReactJS to provide a responsive and user-friendly interface. Complaint categorization and routing are automated using smart algorithms, enabling efficient assignment to relevant departments and reducing manual intervention. The chatbot is developed with the Rasa framework, which allows custom intent recognition and dialogue management. Our methodology emphasizes modular architecture, secure database management with MySQL. Extensive testing has been carried out to ensure accuracy in chatbot responses, robustness of complaint routing, and security of sensitive user data. The expected outcome is a fully functional, scalable, and intelligent grievance redressal system that reduces complaint resolution time, enhances transparency, and builds public trust. By embedding a dual-purpose multilingual chatbot within a secure, modern web framework, this project contributes a novel and socially impactful solution that transforms traditional manual grievance systems into an automated, transparent, and citizen-centric digital service.

Keywords -- e-Grievance Portal, AI Chatbot, Rasa, Complaint Automation, Web Application

Paper ID : A012

Query Flow: A Real-Time Chat Application with Intelligent Question Detection and Role-Based Moderation

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ABSTRACT

The increasing dependence on digital communication platforms has created a demand for intelligent and structured real-time interaction systems. Conventional chat applications mainly support message exchange but lack mechanisms for automatic content organization, intelligent question identification, and effective moderation control. To address these limitations, this paper proposes Query Flow, a real-time chat application integrated with intelligent question detection and role-based moderation. The system automatically detects interrogative messages using pattern-based and keyword-driven analysis techniques and highlights them to improve discussion clarity. This enables structured communication, especially in academic and collaborative environments. Query Flow also implements role-based access control with three levels: Admin, Prime User, and Regular User. The Admin manages rooms and user permissions, Prime Users receive special privileges, and Regular Users participate in discussions under moderation policies. The application is developed using the MERN stack architecture. React.js is used for the frontend interface, Node.js and Express.js handle backend services, MongoDB manages data persistence, and Socket.io enables real-time bidirectional communication. The system supports multi-room functionality, live message broadcasting, file sharing, and secure authentication. Performance analysis shows low-latency message synchronization, efficient room management, and accurate question detection in real-time scenarios. The proposed system enhances user engagement, improves communication clarity, and provides a scalable solution suitable for educational institutions and collaborative platforms.

KEYWORDS: Real-Time Communication Systems, Intelligent Question Detection, Natural Language Processing, Role-Based Access Control, MERN Stack Architecture, Multi-User Chat Platforms, Conversational Intelligence.

Paper ID: A013

AI for Smart Farming: Pest and Disease Detection

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Abstract

Agricultural productivity is largely impacted by the diseases, which leads to a large economical loss for the farmers. Traditional disease detection methods depend on manual examination, which is not only time-consuming but also lacks efficiency. Late detection of crop diseases can even lead to food insecurity. Also, the human factor component increases the likelihood of errors and limits the coverage to a handful of farmers only. To solve this problem, the present research offers a solution, AgroScan AI, a smart deep neural network, based system for automated crop disease diagnosis from leaf images. The suggested method utilizes transfer learning with convolutional neural networks and the modern YOLOv8 object detection framework to deliver precise and instantaneous disease recognition in various plant species such as tomato, potato, bell pepper, rice, and wheat. The publicly available datasets were collected, processed and converted into a unified training format for enhancing model generalization. The model when completely developed was deployed through web platform built on Flask framework which lets users to upload leaf images and receive instant predictions along with confidence scores and suggested remedies. The work of technology in agriculture has been revealed by experiments which not only found their identification rates small error but also the inference times rapid. Besides this, the suggested approach will be able to help in precision agriculture by offering an efficient, scalable and cost, effective mode of monitoring crop health.

Keywords: Crop Disease Detection, Deep Learning, YOLOv8, Convolutional Neural Networks, Transfer Learning, Precision Agriculture, Computer Vision, Image Classification, Smart Farming, Real-Time Plant Disease Identification.

Paper Id: A014

An Ensemble Machine Learning Models Framework for Credit Card Fraud Detection Using SMOTE and XGBoost

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Abstract

In financial security, the detection of credit card fraud is a very serious problem. In fact, credit card fraud, specifically fraudulent transactions (when money is transferred fraudulently from one person to another), accounts for a great deal of lost income each year around the globe. In this paper, we present an entire machine learning pipeline for automatic fraud detection in credit card transactions, as it pertains to the class imbalance that exists within the real world data sets associated with finance. To do this, we have created a common end-to-end orchestration framework that integrates four different algorithms (Logistic Regression, Random Forest, Gradient Boosting, and XGBoost). Since one of the major issues with real world financial data sets is their class imbalance problem, we have incorporated SMOTE as well as rigorous feature scaling of all 21 engineered transactional feature dimensions throughout our analysis. To accomplish this, we have incorporated grid search cross validation while performing hyperparameter optimization to improve the performance of our various models. Our evaluation includes a complete range of comprehensive metrics (e.g., ROC-AUC, precision-recall curves, and confusion matrices) to verify that our proposed processes reliably identify fraudulent activity while minimizing the risk of generating false positives. We have developed an interactive web interface using Flask for the real-time deployment of predictive models. Our experimental results indicate that ensemble methods (in particular, XGBoost) provide superior detection rates and therefore, provide a scalable and easily interpretable solution for implementing fraud prevention systems for financial institutions.

Keywords: Credit Card Fraud Detection, Machine Learning, SMOTE, Class Imbalance, XGBoost, Random Forest, Gradient Boosting, Feature Engineering, Hyperparameter Tuning, ROC-AUC, Ensemble Methods, Real-Time Prediction

Paper Id: A015

DEEP LEARNING BASED FAULT CLASSIFICATION IN RENEWABLE INTEGRATED POWER LINE

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Abstract:

Since the persistent defects can influence the supply of the power, the fast and precise fault classification, position estimation and fault detection are crucial. Based on the incidence of fault, neighbours will be incorporated into the power outage area. For a power system to recover to a healthy state, faults have to be discovered correctly and rapidly. Protection, fault detection, diagnosis, identification and localisation are needed for the power system to operate efficiently. Transmission Line (TL) extensions are required due to increase in the industrialisation and electricity requirement, the complexity of power system network greatly increases. Analysing any weaknesses in this complex network is not easy. This paper reviews the most recent machine learning approaches used in the classification and recognition of problems in power systems.

Keywords - Convolutional Neural Networks (CNN), Real time fault identification, High impedance fault detection, Signal processing, Long short term memory (LSTM), recurrent neural network (RNN).

Paper Id: A016

Fair Value Estimation of stocks using the Discounted cash Flow (DCF) Model in Python

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ABSTRACT

This work introduces a holistic automated stock valuation framework based on the Discounted Cash Flow (DCF) model in Python. The system overcomes the drawback of manual financial analysis by creating an integrated framework comprising real-time data retrieval, automatic cash flow forecasting, and interactive valuation modelling. Our application uses Yahoo Finance API to extract past financial data, performs Free Cash Flows (FCF), and uses discounted cash flow technique to calculate intrinsic stock prices. The system also uses enhanced features such as sensitivity analysis, Monte Carlo simulations for probabilistic valuation, and an interactive web interface developed with Flask. Experimental testing done on stocks from various sectors proves the effectiveness of the model in producing precise valuations in relation to market prices. The platform is both an investment education platform for investors and a real-world analytical model for financial professionals, closing the gap between sophisticated financial theory and understandable investment analysis.

KEYWORDS: Discounted Cash Flow, Stock Valuation, Python, Financial Modelling, Intrinsic Value, Free Cash Flow, Yahoo Finance API, Sensitivity Analysis, Monte Carlo Simulation

Paper Id: A017

AI-Driven Adaptive Learning Management System Using Bayesian and Deep Knowledge Tracing for Real-Time Knowledge Gap Detection

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ABSTRACT

Traditional Learning Management Systems (LMS) use a uniform content delivery approach that does not consider individual differences in learning pace, prior knowledge, and conceptual understanding, often leading to unnoticed knowledge gaps, lower engagement, and inefficient outcomes. To overcome these challenges, this paper proposes Aura LMS, an AI-driven adaptive learning management system that personalizes the learning experience through real-time knowledge tracing and dynamic content adaptation. The system integrates Bayesian Knowledge Tracing (BKT) and Deep Knowledge Tracing (DKT) models to continuously estimate concept-level mastery probabilities using student interactions, quiz responses, and performance patterns. By analyzing learner behavior in real time, the framework identifies weak concepts, predicts potential learning risks, and dynamically restructures learning paths to optimize content sequencing. It also includes a personalized recommendation engine that suggests targeted learning materials based on individual mastery levels. The architecture is built with a React-based frontend, a Python Flask/Django backend, and machine learning frameworks such as TensorFlow and Scikit-learn. Experimental evaluation shows improved engagement, faster concept mastery, and better instructional decision-making through analytics dashboards, contributing to intelligent educational technology by enabling data-driven personalization, proactive intervention strategies, and adaptive learning environments that enhance student performance and retention.

Paper Id: A018

RansomShield: An Intelligent Android Security System for Ransomware Detection Using the Random Forest Algorithm

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Abstract

Ransomware continues to pose a major threat to Android users by locking access to personal data and demanding payment for recovery. This project introduces an intelligent system that identifies potentially harmful ransomware applications by analyzing their behavioral patterns and system-level features. Using supervised machine learning techniques, the model is trained on a labeled dataset of both malicious and benign applications, learning to distinguish between safe and suspicious behaviors. A web-based interface built with the Django framework allows users to upload a parameters for security assessment. The system delivers classification results with supporting details to help users make informed decisions about app safety. This approach enhances Android device protection by providing a robust and intelligent layer of threat detection based on data-driven insights.

Keywords: Android Security, Ransomware Detection, Machine Learning, Malware Classification, Mobile Threat Analysis, Cybersecurity, Supervised Learning, Django Framework, Application Risk Assessment.

Paper ID A019

Green Pilgrimages: Sustainable Waste Management in India's Spiritual Events

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Abstract

Indian spiritual gatherings such as religious festivals, pilgrimages, and mass congregations attract millions of devotees every year. Events like the Kumbh Mela, temple festivals, and spiritual congregations play a vital role in India's cultural and religious identity. However, the large influx of people during these gatherings generates enormous quantities of waste, including plastic, food waste, packaging materials, and other non-biodegradable items. Improper waste disposal during such events can lead to serious environmental challenges such as water contamination, soil pollution, and health hazards for both participants and local communities. Effective waste management in these spiritual gatherings is therefore essential for maintaining environmental sustainability and public health. Strategies such as source segregation, composting of organic waste, recycling initiatives, use of biodegradable materials, and awareness campaigns among devotees can significantly reduce the environmental impact. Additionally, collaboration between government authorities, local municipalities, non-governmental organizations, and volunteers plays a crucial role in implementing sustainable waste management practices. Integrating traditional Indian spiritual values, which emphasize respect for nature and environmental harmony, with modern waste management systems can provide innovative solutions to this issue. Promoting eco-friendly practices during spiritual gatherings not only protects the environment but also reinforces the message that spirituality and sustainability can coexist. This study highlights the importance of sustainable waste management strategies in large-scale Indian spiritual events and suggests practical approaches to ensure cleaner, greener, and more responsible religious gatherings.

Keywords: Spiritual gathering, waste management, green pilgrimage

Paper Id: A020

Design and Fabrication of a continuity sensor-based track inspection robot with rf alerting system.

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Abstract

The safety of railway operations is fundamentally dependent on the structural continuity of the tracks. Even minute cracks or dislocations, if undetected, can escalate into catastrophic derailments. This project focuses on the Design and Fabrication of an autonomous robotic vehicle engineered to replace manual track patrolling with a high-precision, automated alternative. The core of the system is a Continuity Sensor Array, which maintains constant electrical contact with the rail surface to detect any physical breach or separation in real-time. The mechanical design features a lightweight, high-traction chassis optimized for stable movement along standard gauge tracks. Controlled by a central processing unit (Microcontroller), the robot continuously analyzes the feedback from the sensor array. Upon identifying a track discontinuity, the system instantly triggers a wireless Radio Frequency (RF) Alerting Module. This module transmits critical fault data to a remote receiver located at the nearest control station, bypassing the limitations of cellular dead zones. Simultaneously, the robot initiates an emergency braking sequence and activates localized visual indicators to prevent approaching locomotives from entering the compromised section. Experimental results demonstrate that this fabricated prototype offers a high degree of sensitivity to track dislocations while maintaining low power consumption.

Keywords: Chassis design, traction mechanism, structural continuity, mechanical fabrication and braking system.

Paper Id: A021

Obstacle Detection and Avoidance for Electric Trolley Using IoT

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ABSTRACT

This project addresses the safety challenges of collision avoidance in electric trolleys by integrating an IoT-based intelligent obstacle detection system. Utilizing an HC-SR04 ultrasonic sensor mounted on a servo motor, the system performs a continuous 360° environmental scan to identify potential hazards. The device implements a multi-level warning protocol: as proximity decreases, a graduated feedback system—comprising Green, Orange, and Red LEDs alongside an audible buzzer—alerts the operator. Upon reaching a critical safety threshold, the system triggers a high-intensity alarm and automatically engages a motor driver to halt the electric motor, preventing impact. This scalable solution enhances operational safety in urban logistics and industrial environments, directly supporting SDG 9 (Industry, Innovation, and Infrastructure) and SDG 11 (Sustainable Cities and Communities).

Keywords— Arduino Uno, HC-SR04, SG90 Servo Motor, analysis.

Paper Id: A022

Experimental Analysis of a Gear-Based Work Holding Jig For Drilling Operations

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Abstract

Work holding plays a crucial role in machining operations, especially in drilling processes where proper clamping ensures dimensional accuracy and stability. Conventional clamping methods often require more setup time and manual effort, which can reduce productivity in manufacturing environments. To overcome these limitations, this study presents the design and experimental analysis of a gear-based work holding jig developed specifically for drilling operations. The proposed mechanism utilizes a spur gear arrangement to provide uniform clamping force and improved positioning of the workpiece. Experimental testing was conducted to evaluate the performance of the developed jig under drilling conditions. The results indicate that the gear-based jig improves clamping stability, reduces setup time, and enhances machining accuracy when compared with conventional clamping methods.

Keywords: Experimental Analysis, Work Holding Jig, Drilling Operation, Gear Mechanism, Clamping System.

Paper Id: A023

INVESTIGATION OF TOOL TIP FRACTURING DURING FACING AND GROOVING OPERATIONS OF HARD-FACED VALVE SEAT RINGS

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Abstract

This project presents an experimental investigation into the mechanisms of tool tip fracture during facing and grooving operations on hard-faced valve seat rings under interrupted cutting conditions. The primary focus is on impact resistance at the tool tip, considering the influence of tool geometry (rake angle, nose radius, edge chamfer, lead angle), chip-breaking behaviour, cutting parameters, and process-system rigidity. Experimental trials are conducted on cylindrical workpieces simulating valve seat rings, using coated and uncoated carbide inserts in a CNC lathe. Variations in cutting speed, feed rate, depth of cut, and tool overhang are systematically implemented, and the tool life (number of interrupted passes) until tip fracture, along with chip morphology, vibration, and surface finish, are recorded. The results indicate that negative-rake or zero-rake geometry with a chamfer, moderate nose radius, reduced tool overhang, and optimized feed and depth of cut significantly enhance impact resistance and delay catastrophic tool tip failure. The study concludes with a set of recommended tool-geometry specifications and machining parameters to improve tool life and process reliability in facing and grooving of hard-faced valve seat rings.

Keywords: Interrupted cutting, tool tip fracture, impact resistance, hard-faced valve seat rings, facing and grooving operations, tool geometry (rake angle, nose radius, edge chamfer, and lead angle), coated and uncoated carbide inserts, CNC lathe machining, cutting parameters (cutting speed, feed rate, and depth of cut), tool overhang, process rigidity, chip morphology, surface finish, tool life, and machining parameter optimization.

Paper ID: A024

The Role of Competency Mapping in Recruitment and Learning & Development with Reference to L&T

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Abstract

Competency mapping has become strategically significant in ensuring that the acquisition of talent is achieved in line with organizational capability needs especially in engineering and project-related organizations. This paper aims to explore how competency mapping can help in improving effectiveness of recruitment and facilitate Learning and Development (L&D) fusion in Larsen & Toubro (L&T). The study fills the gap between the conventional qualification-based recruiting and competency-based workforce planning. A quantitative research design was used, and primary data were gathered using a structured questionnaire that was given to the employees in various functional departments. Descriptive analysis and chi-square tests were used to identify relationship between demographic factors and attitudes toward competency-based recruitment practices. The results show that competency mapping is a significant factor in enhancing job-person fit, structured evaluation of candidates, and systematic skill deficiencies to be met through specific training interventions. Moreover, the combination of competency frameworks and Learning & Development improves the sustainability of capability and performance in the long run. The research is relevant to the literature by showing the relationship between competency-based recruitment and strategic human resource development empirically in large engineering companies. Practical implications imply that the organizations can improve management systems of talents by institutionalizing competency models in functions of recruitment and development.

Keywords: Competency Mapping; Competency-based recruiting; Learning and Development; Strategic Human Resource Management; Skill Gap Analysis; Engineering Industry; Talent Management.

Paper Id: A025

Real-Time Load Forecasting Using Light Weight Machine Learning Models on Stm32

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Abstract

Accurate short-term load forecasting is vital for efficient energy management and reliable power system operation. This project presents a lightweight machine learning-based prediction system implemented on an STM32 microcontroller. Real-time electrical data is acquired using voltage and current sensors, preprocessed to remove noise, and normalized for model input. A Support Vector Regression (SVR) algorithm, trained on historical consumption patterns, is deployed to capture both linear and nonlinear variations in demand. The system provides low-latency predictions directly at the edge, ensuring autonomy without reliance on cloud platforms. Forecasted results are displayed locally and can be transmitted to external monitoring systems for analysis. Experimental evaluation demonstrates that the SVR-based STM32 implementation achieves accurate and reliable forecasting, highlighting its feasibility for smart grid applications, proactive demand management, and sustainable energy utilization.

Keywords: Machine Learning, Support Vector Regression (SVR) algorithm, Forecasting.

Paper Id : A026

MedGuard AI – Smart Medicine Reminder and Digital Health Record Management System

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ABSTRACT

Managing personal medical records and adhering to prescribed medication schedules is a common challenge due to scattered documentation and the risk of missed doses. This project proposes a web-based Medical Records and Medicine Reminder System that provides a centralized platform for efficiently managing healthcare information. The system includes a user-friendly landing page with secure user registration and login. After authentication, users can access an interactive dashboard that acts as the central hub of the application. Through this dashboard, users can manage multiple healthcare modules such as medicines, prescriptions, medical records, doctor visits, and hospital visits in an organized manner. The system also enables users to store important medical documents like prescriptions, diagnostic reports, and scan records digitally for easy access and better record management. A key feature of the system is the medicine reminder module, which allows users to schedule medications with dosage details and receive timely alerts and notifications. This helps improve medication adherence and reduces missed doses. Future enhancements may include cloud storage integration, mobile application support, health analytics, and integration with hospital information systems to further improve digital healthcare management.

KEYWORDS: Medicine Reminder System, Medical Records Management, Digital Health Monitoring, Patient Data Management, Secure Web Application

Paper Id: A027

AlgoTrack : AI-Powered Coding Analytics & Personalized Interview Prep

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Abstract

In the running field of computer science and software engineering, coding skills and the ability to solve analytical problems are key elements for excelling in competitive programming and technical interviews. While sites like LeetCode, Codeforces, and GFG proposed a variety of problems and training opportunities, they usually have limited capabilities in tracking performance, providing personalized learning insights, or offering structured interview preparation. In terms of features, this limitation translates into students and programmers not receiving a consistent understanding of their progress, nor personalized suggestions as in customized to their strengths and weaknesses. In response, we propose AlgoTrack, an AI/ML-powered service that aggregates coding activities from multiple sites and provides actionable insights using analytics. By applying AI/ML techniques and machine learning analytics, AlgoTrack identifies performance patterns, pinpoints areas of weakness, and suggests practice problems aligned with users' goals. Additionally, it provides personalized preparation plans designed to train users in problem-solving skills and interview preparation. The goals of this project include building an analytics framework, providing user-friendly recommendations, and improving the effectiveness of technical preparation methods.

Keywords: AI/ML, Coding Analytics, Personalized Learning, Interview Preparation, Competitive Programming, Machine Learning, Educational Technology.

Paper Id: A028

Women Safety Night Patrolling IoT Robot

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Abstract

Ladies security has emerged as one of the most important needs in our nation, taking into account what is happening in the metro metropolitan neighborhoods and other big urban locations. A simple safety gadget that aids victims in the event of unforeseen danger is essential in this era of cutting-edge technology and smart devices. This study provides a detailed description of the design and implementation of a prototype for an electronic device that could, in the future, function as a safety wear. These days many women, young girls & mothers are seen vanishing from public spaces, streets, and public transit and they face physical and sexual abuse. Most lawsuits are routinely lodged on issues like abduction, intimidation, or assaults and these crimes are rising day by day. To stop these crimes, an embedded system-based Women Safety Night Patrolling IoT Robot is designed for street surveillance to monitor a live update to the control room during nighttime. This also comes with a unique alarm feature that gets triggered when it receives an abnormal level of sound from the environment (these things don't happen quite usually). This night patrolling robot notifies society's people whenever a woman shouts for rescue. This prototype is predefined to patrol the street at night time. Two robots are installed for a road, and the primary purpose of this project is to ensure public safety in emergencies.

Paper Id: A029

REAL-TIME MULTI-AGENT FRAMEWORK FOR DETECTING CASCADING FAILURES IN MACHINE LEARNING PIPELINES

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Abstract

Machine learning systems deployed in production environments are commonly implemented as multi-stage pipelines consisting of data ingestion, preprocessing, feature engineering, model inference, and service deployment. Since these stages are highly interdependent, a failure in one component can propagate through the pipeline and lead to cascading failures that degrade the performance and reliability of the entire system. Traditional monitoring techniques typically evaluate individual components separately and are unable to detect failure propagation across pipeline stages in real time.

This project proposes a Real-Time Multi-Agent Framework for Detecting Cascading Failures in Machine Learning Pipelines. The proposed system employs multiple intelligent monitoring agents that observe different stages of the pipeline, including data quality, model performance, and service reliability. Each agent continuously analyzes system metrics and generates anomaly scores that are aggregated by a central propagation risk module. The system calculates a cascading risk score based on the relationships between anomalies detected across different components. When the cascading risk exceeds a predefined threshold, the system generates alerts and provides real-time monitoring through a visualization dashboard.

The proposed framework improves the reliability and observability of machine learning systems by detecting early-stage anomalies before they propagate into large-scale failures. Experimental evaluation demonstrates that the multi-agent monitoring approach enhances early failure detection and provides a scalable solution for modern machine learning operations environments.

Paper Id: A030

Hybrid Speech-Based Text Processing System with Offline Recognition, Summarization, and Translation

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ABSTRACT

Speech-based technologies play an important role in modern human–computer interaction. However, many speech recognition systems depend on internet connectivity, which limits their use in offline environments. This research proposes a Hybrid Speech-Based Text Processing System with Offline Recognition, Summarization, and Translation. The system captures speech input through a microphone and converts it into text using an offline speech recognition engine. The generated text is then processed using natural language processing techniques to produce concise summaries and translations into multiple languages. The system integrates technologies such as Vosk for offline speech recognition, transformer-based models for summarization, and neural machine translation for multilingual support. Experimental results show that the proposed system provides reliable speech-to-text conversion, effective summarization, and accurate translation even in low or no internet connectivity conditions.

KEYWORDS : Speech Recognition, Natural Language Processing, Text Summarization, Machine Translation, Offline AI Systems, Transformer Models, Speech-to-Text, Hybrid AI System

Paper Id: A031

MINDFEM SMART HEADBAND

An AI-Enabled FemTech and Mental Wellness Wearable

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Abstract

The MindFem Smart Headband is a wearable prototype designed to monitor women's mental and physiological health. It uses an Arduino-based microcontroller as the main processing unit. The system collects biological signals in real time through embedded sensors. An EEG sensor monitors brain activity and mental state. A MAX30100 PPG sensor measures heart rate and oxygen saturation (SpO₂). An LM35 temperature sensor detects body temperature variations. All sensor data is processed by the microcontroller. The processed information is displayed on an LCD for real-time monitoring. A buzzer provides alerts during abnormal conditions. A DF Player Mini module delivers voice-based health notifications. Wireless communication is enabled through a Wi-Fi/IoT module. This allows remote monitoring via mobile devices or cloud platforms. A 0regulated power supply with a battery and 7805 voltage regulator ensures stable operation. The system is designed as a scalable and affordable health solution. It supports future integration of AI-based analysis and mobile health applications.

Paper Id: A032

AI-Driven Automated Proctoring System for Secure Online Examinations

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ABSTRACT

Online examinations are widely used today, but preventing cheating is still a major challenge. Most existing online exam systems use basic webcam monitoring such as face detection and simple rule-based checks. These methods often generate false cheating alerts and do not provide clear reasons for their decisions. In addition, many systems do not properly monitor browser misuse or protect student privacy. To overcome these limitations, this project proposes a “Smart Online Examination System with AI Proctoring”. The system continuously monitors student behavior instead of checking only single events. It calculates a cheating risk score based on repeated actions like looking away, face absence, and tab switching. The system uses multi-factor monitoring by combining webcam analysis with real-time browser and screen activity tracking. Object detection is used to identify unauthorized items such as mobile phones. An Explainable AI approach is included to clearly show why a student is flagged as suspicious. Important exam events are stored securely using tamper-proof logging techniques. The system also follows a privacy-aware approach by processing sensitive data locally. Overall, the proposed system provides a more accurate, secure, and transparent online examination solution.

KEYWORDS: AI proctoring, online examination system, cheating detection, computer vision, face and eye tracking, behavior analysis, browser and screen monitoring, explainable artificial intelligence (XAI), real-time monitoring, multi-factor proctoring, privacy-aware security, and secure examination environment.

Paper Id: A033

Grid Simulation and Real-Time Agent Visualization

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Abstract :

Grid-based simulations are widely used in fields such as robotics, artificial intelligence, game development, and traffic management to study the movement and interaction of multiple agents in a structured environment. This project focuses on the design and implementation of a Grid Simulation and Real-Time Agent Visualization system that enables agents to navigate within a two-dimensional grid while adhering to boundary constraints and avoiding collisions with other agents. The simulation operates using discrete time steps, allowing the positions of agents to be updated dynamically as they move through the grid environment. The proposed system models the grid as a collection of cells where each cell can either be empty or occupied by an agent. Agents follow predefined movement rules to travel across the grid while maintaining safe distances from other agents and respecting the grid boundaries. The simulation engine continuously tracks agent positions and processes movement decisions in each time step, ensuring that collisions are prevented and movement constraints are satisfied. This approach allows the system to realistically represent multi-agent behavior in a controlled environment. A key feature of the project is the real-time visualization module, which graphically displays the grid and the movement of agents as the simulation progresses. The visualization component provides an interactive interface that allows users to observe the current state of the grid, monitor agent positions, and understand the dynamics of agent interactions. The system also includes user controls such as start, pause, reset, and parameter adjustment, enabling users to manage the simulation flow and experiment with different scenarios. The proposed grid simulation framework serves as an effective platform for studying multi-agent navigation, collision avoidance strategies, and dynamic system behavior. By combining simulation logic with interactive visualization, the system provides a powerful educational and research tool that can be extended for applications in robotics path planning, swarm intelligence, traffic modeling, and smart environment simulations.

Keywords : MATLAB , Python , Sensors

Paper ID : A034

DevNarrator: A Context-Aware Autonomous Personal Branding Agent

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Abstract

As the role of digital professional identity becomes more important, we can see that there's a clear push towards smart systems that can automatically collect and display what a developer achieves across various platforms. A developer may participate in various activities like coding contests, open-source contributions, and even project developments, resulting in fragmented records of their progress. Most of the existing generative AI tools that are developed for content generation are mostly reactive to user prompts or scheduled events. As a result, these tools are not able to maintain long-term contextual memory or a continuous narrative.

DevNarrator, as a context-aware, autonomous personal-branding agent, can monitor a developer's activities and generate meaningful narratives of their growth. It's based on an asynchronous, three-stage architecture. A distributed message pipeline handles all of a developer's activities. To maintain contextual memory, we can see that a Tri-Store Memory Model, which includes a combination of vector databases, graph databases, and NoSQL databases, is being utilized. A context resolver can utilize this memory model to generate narratives with the aid of a large language model.

This architecture shows how distributed systems and generative AI can come together to create scalable, context-aware personal-branding agents.

Keywords: Generative AI, Autonomous Agents, Asynchronous Architecture, Knowledge Graph, Vector Database, Personal Branding.

Paper Id: A035

Development of Automatic Tailstock Drilling Attachment in Lathe Machine

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Abstract

Any industry has its own desire to maintain their ability to provide safe and secure drilling of their customers' hazardous materials. Addressing these challenges is an important task and the efficient delivery of their cargo plays a vital role in the economy of the country. This system provides safety and accurately, when components must drill operation on lathe. This time the Automatic feeding system works more efficiently and speedy. In this system problems that arrive in manual feeding are not constant feed is eliminated by using constant speed by motor speed which assembles to rotate spindle and to the direction towards head stock. The spindle drills the position and moving up direction then, the wood plate will rotate for next position. In traditional lathe operations, drilling using the tailstock requires manual feed control, which may lead to inconsistent feed rates, operator fatigue, reduced productivity and dimensional inaccuracies. The development of an automatic tailstock drilling attachment for a conventional lathe machine aims to enhance machining efficiency, accuracy and operator safety by automating the drilling process.

Keywords: Automatic Tailstock, Drilling Attachment, Automation in Machining, Feed Mechanism, Lathe Machine, Tailstock Assembly, Drilling Operation.

Paper ID: A036

Personalized Learning App for Next-Gen Education

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ABSTRACT

The advancement of digital education requires the development of intelligent systems that can adapt to the different demands of the learners and improve the results of the learning process. This paper proposes a Personalized Learning Application for the next generation of education, utilizing the concepts of Artificial Intelligence (AI), Machine Learning (ML), and data-based methodologies. The proposed intelligent system will assess the student's skills through diagnostic tests, performance monitoring, and behavioral analysis, including sentiment-based cognitive assessment. Based on the data collected, the system creates dynamic learning paths by providing learners with recommended learning content, micro-learning, and quizzes created using AI. The system uses real-time content aggregation, which aggregates content from web-based sources, thus providing learners with relevant and timely information. There is an adaptive difficulty adjustment mechanism, which is used to bridge learning gaps by adjusting the complexity of learning content. Moreover, the system includes sophisticated tools such as cognitive fatigue recognition, performance analytics, and career readiness assessment, which can help bridge gaps between academic progress and professional skills. Finally, the system design, which is based on React front-end and Python back-end with ML, is scalable and allows for real-time personalization.

Key Words— Personalized Learning, Adaptive Learning Systems, Cognitive Analysis, Recommendation Systems, Learning Analytics, Sentiment Analysis

Paper Id: A037

AI-based Home Service Booking System

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Abstract

Most of the time, trying to get a home appliance fixed is a huge hassle. You open a service app, tap on whatever is broken, and just hope the person they send actually knows how to handle your specific issue. Standard apps do not really understand the problem; they just pass the request along. I wanted to build a project that fixes this gap by trying to diagnose the issue before anything else happens. This project is an AI-Powered Home Service Booking platform. Instead of acting like a simple digital phonebook, it attempts to figure out what is wrong, predicts how bad the problem is, and generates a rough cost estimate before confirming an appointment. This helps prevent surprise bills and ensures the right technician gets the job. I built the system using a microservices approach with three main pieces. The user interface is built with React.js, letting people easily type out their appliance issues like they are chatting. Behind the scenes, a Java Spring Boot backend takes care of user accounts, the booking pipeline, and generating the final automated invoices. The actual smart diagnosis happens in a separate Python service built with FastAPI. When a user types in their problem, this service processes the text using natural language processing techniques—specifically TF-IDF and keyword matching—to map their description to a known technical fault from my dataset. Doing this upfront text analysis gave me room to add some really helpful features. For example, if someone describes an issue that turns out to be super simple, like a dead AC remote battery, the system will actually provide self-help steps so they do not waste money booking a repair. If they do need a technician, my custom matching formula goes through available workers and scores them based on their exact experience with that specific fault, along with their past ratings. On top of that, the text-checker constantly looks for dangerous words like "sparks" or "gas leak." If it sees those, it immediately throws safety warnings on the screen. Basically, the idea is to use text data and basic machine learning logic to make booking a repair safer, more transparent, and a lot less frustrating for everyone involved.

Keywords: Microservices, Computer Vision, Local LLM, Predictive Diagnostics , Smart Booking Systems

Paper Id: A038

An Intelligent Inventory Management System with Sales Prediction Using Machine Learning

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Abstract

Effective inventory management is essential for maintaining business efficiency and customer satisfaction, especially in retail and supply chain environments. However, traditional inventory systems often rely on manual processes and lack the ability to accurately predict future demand, leading to issues such as overstocking, understocking, and increased operational costs. To address these challenges, this paper proposes a Machine Learning Based Inventory Management System with Sales Prediction. The proposed system integrates inventory tracking with data-driven forecasting techniques to improve stock management and decision-making. The system collects and analyzes historical sales data, including product details, quantity sold, and transaction dates, and applies machine learning algorithms such as Linear Regression and Random Forest to predict future sales trends. Based on these predictions, the system provides intelligent stock recommendations to optimize inventory levels and reduce wastage. Additionally, the system includes modules for data preprocessing, inventory monitoring, and visualization of results through reports and charts. Experimental results demonstrate that the proposed system improves forecasting accuracy and enhances operational efficiency by enabling proactive inventory planning. The integration of predictive analytics with inventory management reduces manual effort, minimizes errors, and supports informed decision-making. This approach is particularly beneficial for small and medium-scale enterprises aiming to improve profitability and streamline inventory operations.

Keywords: Inventory Management, Sales Prediction, Machine Learning, Demand Forecasting, Stock Analysis, Business Intelligence, Inventory Optimization, Predictive Analytics

Paper Id: A039

Taxora: An AI-Based Accounting and Compliance Platform for SMEs and Chartered Accountants

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Abstract

Small and medium-sized businesses (SMEs) in India continue to rely on manual financial management practices involving extensive paperwork and poorly organized records. These limitations often lead to delays in tax compliance, increased operational costs, and a higher risk of documentation errors. Chartered Accountants (CAs) handle large volumes of client invoices and financial data that require continuous manual verification. Compliance-related tasks consume a significant portion of their time, reducing productivity and increasing the possibility of inaccuracies in reporting and filing. This study introduces Taxora, an AI-driven accounting and compliance platform that digitizes financial workflows and enables secure, role-based collaboration between SMEs and Chartered Accountants. The system automates document handling and provides decision support through integrated tools. Taxora employs a fine-tuned LayoutLMv3 model to extract structured information from invoices by analyzing both textual and spatial features. The extracted data is processed through a compliance engine based on Indian tax regulations to generate audit-ready GST summaries and reports. The platform is implemented using Django and PostgreSQL with an emphasis on automation, privacy, and scalability. The system significantly reduces manual data entry and improves extraction accuracy, resulting in faster processing, improved operational efficiency, and more reliable compliance for SMEs and Chartered Accountants.

Keywords: Invoice Automation, SME Accounting, GST Compliance, OCR and NLP, Financial Analytics, AI in Accounting

Paper Id: A040

An Attention-Enhanced Deep Learning Framework for Robust and Generalized Rice Leaf Disease Detection

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ABSTRACT

Rice leaf diseases pose a serious threat to crop productivity and global food security. Early and accurate identification of diseases such as bacterial blight, leaf blast, and brown spot is essential for effective crop management and yield improvement. Traditional disease detection methods rely on manual inspection by agricultural experts, which is often time-consuming, subjective, and inefficient for large-scale monitoring. Recent advancements in deep learning have enabled automated plant disease detection using image-based analysis. However, conventional deep learning models may struggle to capture complex visual patterns and often show limited generalization across diverse datasets. This study proposes an attention-enhanced deep learning framework for robust and generalized rice leaf disease detection. The proposed approach integrates an attention mechanism with a deep convolutional neural network to improve feature extraction and focus on discriminative disease regions in leaf images. The attention module helps the model capture both local and global contextual information, thereby enhancing classification performance and reducing the influence of irrelevant background features. To ensure robustness and improve model reliability, the framework is evaluated using a cross-validation strategy. The performance of the proposed model is assessed using standard evaluation metrics such as accuracy, precision, recall, and F1-score. Experimental results demonstrate that the attention-enhanced framework achieves superior performance compared to conventional CNN models in terms of classification accuracy and generalization capability. The proposed method provides an efficient and reliable solution for automated rice leaf disease detection and can support intelligent agricultural monitoring systems for early disease diagnosis and improved crop management.

Paper Id: A041

AI-Based Public Crowd Risk Prediction System

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Abstract

Artificial Intelligence and deep learning have significantly enhanced modern surveillance systems by enabling automated analysis of complex visual data. Monitoring crowd behavior in large public spaces remains a critical challenge, as traditional systems rely on manual observation and fail to detect risks early.

This paper presents an **AI-based public crowd risk prediction system** that integrates YOLOv8 for detection, ByteTrack for tracking, and I3D for behavior recognition, along with optical flow for motion analysis. The proposed system combines spatial and temporal features using a fusion-based approach to predict crowd risk levels in real-time.

Experimental results demonstrate high accuracy and reliable performance, making the system suitable for real-world applications. The study also highlights the advantages of multi-model integration and discusses future improvements for intelligent crowd monitoring systems.

Keywords: Crowd Risk Prediction, Deep Learning, YOLOv8, ByteTrack, I3D, Computer Vision

Paper Id: A042

NEXT GEN RESPIRATORY CARE: REAL - TIME MONITORING AND DISEASE PREDICTION USING IOT

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Abstract:

Respiratory diseases remain an important global health problem, requiring innovative solutions for early detection, monitoring, and management. The integration of the Internet of Things (IoT) into respiratory care illustrates a transformative approach to monitoring real time and disease predictions. In this Project, we examine the development of IoT-based systems that continuously pursue respiratory parameters such as oxygen saturation, airflow, and lung function through portable and environmental sensors. The system can look at the data it has collected, find problems, and predict respiratory diseases like asthma, COPD, and pneumonia. The proposed solution aims to improve patient outcomes, reduce hospital stays, and improve quality of life through aggressive interventions in the healthcare system. The main goal of this Project is to design and develop intelligent IoT-based respiratory monitoring systems that can track airway health in real time. The system integrates data from several sources, including portable devices, medical devices, and environmental sensors, allowing for comprehensive analysis of respiratory parameters. By using artificial intelligence and machine learning, the system aims to identify high-risk patients to prevent illness, recognize early warning signs, and enable timely medical interventions. This is also examines the role of IoT in improving the functionality of remote monitoring and telehealth functions, allowing health profession relatives to access real-time patient data for remote diagnosis and ongoing care. Furthermore, the purpose of the Project is to minimize hospital stays by facilitating early detection and active management of diseases and ultimately improving patient outcomes and general quality of life.

Paper Id: A043

AI BASED SMART DRYER SYSTEM FOR COIR FIBERS

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Abstract

An AI-based smart dryer system for coir fibers is developed to enhance drying efficiency, ensure uniform moisture removal, and reduce energy consumption in coir processing industries. The system incorporates advanced sensors to continuously monitor parameters such as temperature, humidity, and moisture levels of the fibers. Using machine learning algorithms, the system analyzes real-time data and automatically adjusts drying conditions to achieve optimal results. This reduces dependency on manual control and minimizes errors like over-drying or uneven drying. The smart dryer improves product quality by maintaining consistent fiber characteristics and prevents material damage. Additionally, it increases productivity by reducing drying time and operational costs. The integration of IoT enables remote monitoring and control, making the system more flexible and user-friendly. Overall, this AI-based solution promotes sustainable and efficient coir fiber processing, making it highly suitable for modern industrial applications.

Keywords: Machine Learning Algorithm, Prevent Materials, Artificial Intelligence.

Paper Id: A044

Battery Degradation and Energy Consumption Pattern Analysis of Electric Three-Wheelers Using a IoT Enabled Data Acquisition System

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Abstract

Battery life prediction of electric vehicles largely depends on monitoring the battery State of Health (SOH). Key parameters such as voltage, current, and temperature play an important role in assessing battery condition and estimating the remaining operational life before failure occurs and to ensure safe operation. In this paper, a customized data acquisition system is developed for L3-type electric three-wheelers (E3Ws), which are widely popular in the Indian automobile market. The proposed hardware prototype integrates with an internet-based middleware server to collect and analyze real-time battery operational data. This enables monitoring of the energy consumption pattern under different road traffic scenarios which helps in evaluating battery health and identifying degradation trends. A modified coulomb counting technique is implemented to estimate the net Depth of Discharge (DOD) from an onboard 4.8 kWh lead-acid battery pack during real-time vehicle movement. The developed measurement system uses a dual-polarity non-invasive current sensing technique, allowing the system to distinguish between charging and discharging cycles. The prototype is capable of sensing high current discharge up to 50 A in real time. Furthermore, it can identify road congestion by analyzing variations in the energy consumption pattern of the E3W vehicle dynamics data. The developed system demonstrates a high measurement accuracy of 98.6% and has been tested for usability, safety, and reliability. A map-based visualization interface on a mobile platform is also implemented to display energy consumption patterns throughout the driving range of the E3W.

Keywords: Electric Three Wheeler, Internet of Things, Coulomb Counting, Depth of Discharge, Battery Monitoring.

Paper Id: A045

Self-Reporting Infrastructure Stress Drone (SRIS-Drone)

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Abstract:

The SRIS-Drone (Self-Reporting Infrastructure Stress Drone) is designed to detect structural damage in buildings and bridges efficiently. Traditional inspection methods are time-consuming and risky for human inspectors. This project uses drone technology combined with Artificial Intelligence for safer monitoring. The drone captures real-time images using a high-resolution camera. These images are processed using a Convolutional Neural Network (CNN). The system identifies cracks, defects, and stress points in structures. Detected data is analyzed and stored in a database for further evaluation. This reduces manual effort and improves inspection accuracy. The system is useful in smart cities, disaster management, and maintenance. Overall, the project ensures safety through early detection and automated monitoring.

Keywords: SRIS-Drone, Infrastructure Stress Detection, Convolutional Neural Network (CNN), Image Processing, Structural Health Monitoring.

PAPER ID: A046

**A COMPARATIVE ANALYSIS ON RISK AND
RETURN ANALYSIS OF LARGE CAP AND SMALL
CAP FUND**

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Abstract

This study examines the difference in risk and return between large-cap and small-cap mutual funds. The objective is to analyze how these two categories perform over a given period and to assess the level of uncertainty linked to their returns. Large-cap funds generally invest in well established companies with strong financial performance, which often results in more stable growth. In contrast, small-cap funds focus on smaller companies that offer higher growth opportunities but are more sensitive to market movements. The research uses secondary data collected from selected funds and evaluates their performance using measures such as average returns and variability of returns. This comparison provides a clear understanding of the trade-off between potential returns and associated risk. The results indicate that large-cap funds tend to deliver consistent performance with relatively lower fluctuations, whereas small-cap funds may achieve higher returns but experience greater variability. The study supports investors in making informed decisions by aligning investment choices with their financial objectives and risk preference.

Key words: Risk, Return, Large Cap Fund, Small Cap Fund .

Paper Id: A047

TranscriptoBot: AI System for Multilingual Speaker Wise Speech Intelligence

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Abstract

This project presents an AI-driven system for real-time and offline transcription of multispeaker conversations with automatic translation of Indian regional languages into English. The system captures live microphone audio or uploaded audio/video files, preprocesses the signal using FFmpeg, and applies a deep learning-based Automatic Speech Recognition model (Whisper) to generate accurate text transcripts with automatic language detection and translation. Speaker diarization is performed using Pyannote.audio to identify and segment speech by different speakers. Detected speaker segments are analyzed to identify temporal overlaps in speech. The resulting speaker-wise transcript is processed using transformer based Natural Language Processing models (BART/T5) to produce concise summaries. The system is implemented using Python, Flask-based APIs, and audio processing libraries, and operates with open-source models without reliance on paid cloud services. The output is presented through a web interface that displays transcripts, speaker labels, detected overlaps, and summaries. The solution is intended for classrooms, meetings, discussions, and interviews where automated documentation of multilingual, multi-speaker conversations is required.

Keywords: Artificial intelligence, machine learning, deep learning, natural language processing, academic automation, research recommender, data science, big data analytics, web development

Paper Id: A048

DEEP LEARNING BASED FAULT CLASSIFICATION IN RENEWABLE INTEGRATED POWER LINE

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Abstract:

Advanced platforms for eliciting strong cytotoxic CD8⁺ T-cell immune responses against cancer cells have been made possible using immune -engineered nanomaterials. Even though adoptive T-cell treatments and immune checkpoint inhibitors have revolutionised oncology, many solid tumours still exhibit resistance because of immunosuppressive tumour microenvironment (TME), insufficient T-cell priming, and poor antigen presentation. By facilitating the tailored transport of tumour antigens, nucleic acids, and immunostimulatory adjuvants to antigen-presenting cells—particularly dendritic cells—nanotechnology presents special chances to get around these restrictions. Strong CD8⁺ T-cell activation is facilitated by engineered nanoparticles that improve lymph node trafficking, shield antigens from deterioration, encourage endosomal escape, and ease cross-presentation via major histocompatibility complex class I pathways. Multifunctional nanosystems can also promote type I interferon signalling, alter the TME, and work in concert with immune checkpoint blockage to maintain T-cell effector function. Inorganic nanomaterials, polymeric carriers, lipid nanoparticles, and biomimetic systems have shown encouraging preclinical results and are moving closer to clinical translation. Immunoengineered nanomaterials offer a revolutionary approach to boosting anti-tumor immunity and increasing therapeutic outcomes in cancer immunotherapy, despite issues with safety, scalability, and tumour heterogeneity.

Keywords: Immunoengineered nanomaterials; Cytotoxic CD8⁺ T cells; Cancer immunotherapy; Tumor microenvironment (TME); Antigen cross-presentation; Dendritic cells; Nanoparticle-based vaccine; Lymph node targeting; Immune checkpoint blockade; Type I interferon signaling; Biomimetic nanocarriers; Lipid nanoparticles.

Paper Id: A049

AI-Driven Zero-Trust Architecture for Post-Quantum Data Security

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ABSTRACT:

The rapid evolution of artificial intelligence and the imminent rise of quantum computing are redefining the cyber security threat landscape. Traditional perimeter-based security models and classical cryptographic algorithms are increasingly inadequate against sophisticated AI-driven attacks and future quantum decryption capabilities. This paper proposes an AI-Driven Zero-Trust Architecture (ZTA) integrated with Post-Quantum Cryptography (PQC) to ensure resilient and future-proof data protection.

The proposed framework adopts a strict zero-trust model where no user, device, or application is inherently trusted, regardless of network location. Machine learning algorithms are employed to continuously monitor and analyze encrypted traffic patterns, enabling real-time anomaly detection without compromising data privacy. By leveraging behavioral analytics, adaptive risk scoring, and automated response mechanisms, the system proactively mitigates insider threats, lateral movement, and advanced persistent attacks.

To address the emerging quantum threat, the architecture integrates NIST-recommended post-quantum cryptographic algorithms to safeguard data confidentiality, integrity, and authentication against quantum-enabled adversaries. The hybrid implementation ensures backward compatibility while enabling a seamless transition toward quantum-resistant security infrastructure.

This integrated approach not only enhances present-day cyber security resilience against AI-powered threats but also establishes a robust defense mechanism for the post-quantum era. The proposed solution offers scalability, automation, and long-term cryptographic sustainability, making it suitable for enterprise networks, critical infrastructure, and cloud-based environments.

Paper id: A050

ECO-MED INTELLIGENT PLANT DETECTION AND ANALYSIS SYSTEM

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Abstract

Eco-Med Intelligent Plant Detection and Analysis System is an advanced solution that integrates artificial intelligence, computer vision, and environmental sensing to identify, classify, and monitor plant species in real time. The system utilizes image processing techniques and machine learning algorithms to detect plant health conditions, diseases, and growth patterns with high accuracy. It supports sustainable agriculture and ecological conservation by enabling early diagnosis and data-driven decision making. Additionally, the system provides user-friendly interfaces for farmers, researchers, and environmentalists to access insights and recommendations. This innovation enhances productivity, reduces resource wastage, and promotes eco-friendly practices in modern agricultural and environmental management systems.s

Paper id: A051

Carboxymethyl cellulose coated Metal oxide nano composites : An efficient catalyst for the degradation of methylene blue dye

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Abstract

The issue of water pollution resulting from synthetic dyes has emerged as a significant environmental challenge, primarily due to their durability, harmfulness, and resistance to standard treatment techniques. Among these contaminants, Methylene Blue is extensively utilized in the textile and related sectors, presenting considerable ecological and health hazards when released into water bodies. This study examines the synthesis, characterization, and utilization of carboxymethyl cellulose (CMC) coated magnesium oxide and Aluminium oxide nanoparticles (MONPs) and aimed at the effective removal and degradation of methylene blue from water sample. The coated MgO nanoparticles' high surface area, increased reactivity, and adjustable electronic structure led to enhanced adsorption and photocatalytic degradation capabilities. To improve stability, dispersibility, and recovery efficiency, CMC was integrated as a supporting matrix to create hybrid nanocomposite materials. The efficiency of dye removal was assessed under various operational conditions, including pH, catalyst dosage, contact duration, and initial dye concentration. Photocatalytic tests revealed effective degradation of methylene blue under light exposure through the production of reactive oxygen species. Kinetic analyses indicated that the degradation process adhered to pseudo-first-order kinetics under optimized conditions. Studies on reusability and regeneration affirmed the stability and prolonged catalytic efficacy of the synthesized nanocomposites. The results indicate that systems based on MgO nanoparticles supported by CMC composites, provide a cost-effective, efficient, and environmentally friendly solution for treating dye-contaminated wastewater. This research contributes to the development of nanotechnology-based remediation strategies for managing industrial effluents.

Keywords: Nanotechnology; Metal oxide nanoparticles; Photocatalysis; Carboxymethyl cellulose; Methylene blue; Dye degradation; Wastewater treatment; Environmental remediation; Adsorption kinetics; Nanocomposites.

Paper Id: A052

A systematic review literature on Explainable AI models in Medical Image Diagnosis

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Abstract

The integration of artificial intelligence (AI) into medical image analysis has led to significant advancements in diagnostic accuracy and efficiency. However, the opacity of complex AI models, particularly deep learning systems, raises critical concerns regarding trust, accountability, and clinical adoption. Explainable AI (XAI) has emerged as a pivotal research area to bridge the gap between high-performing models and the interpretability required for clinical decision-making. This review provides a comprehensive examination of current XAI methods applied to medical imaging, categorizing them into saliency-based, attribution-based, concept-based, and counterfactual approaches. This review discusses the clinical relevance of these methods, highlighting the challenges in aligning AI explanations with human reasoning. Further, this work analyses evaluation strategies for interpretability, explore the inherent trade-offs between model accuracy and explainability, and address the limitations of existing techniques, especially in the context of rare and complex medical cases. The roles of uncertainty estimation and multimodal data integration in enhancing explainability are also examined. In addition, we consider regulatory, ethical, and societal implications critical to real-world deployment. Finally, we identify emerging trends such as causal explanations, interactive systems, and personalized XAI, outlining key research directions for the future. This review aims to provide researchers, clinicians, and policymakers with an organized understanding of the state-of-the-art and the pressing challenges in making AI truly explainable and clinically viable in medical imaging.

Keywords— XAI, Deep Learning, Interpretability, Saliency-based Methods, Attribution-based Methods, Counterfactual Explanations, Clinical Adoption

Paper Id: A053

**Artificial Intelligence Adoption and Business
Performance: A Longitudinal Case Study of Freshworks
with Implications for SMEs**

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Abstract

Artificial intelligence (AI) is fundamentally transforming business operations, particularly for Indian small and medium-sized businesses aiming to stay sustainable and competitive. By focusing on data-driven decision-making, process automation, and enhanced customer interactions, AI adoption is improving Small and Medium Enterprises (SME) performance. Using Freshworks, an Indian SaaS company, as a case study, this article demonstrates that Freshworks use of AI analyzed through secondary data from filings, disclosures, and public sources has contributed to notable shifts: rapid initial expansion, followed by steady, efficiency-led growth. Persistent obstacles, such as limited technical expertise, infrastructure, and funding, remain significant, yet research consistently indicates AI's potential to drive long-term, sustainable growth for Indian SMEs.

Keywords: AI Adoption, SMEs, Freshworks, Artificial Intelligence (AI)

Paper Id: A054

OPTIMIZATION OF HOLE POSITIONING USING A CUSTOM- DESIGNED DRILL JIG FOR CYLINDRICAL COMPONENT

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Abstract

Accurate hole positioning is a critical requirement in the manufacturing of cylindrical components used in mechanical assemblies, as even small positional errors can lead to misalignment, reduced product quality and increased rejection rates. Traditional drilling methods that rely on manual marking and alignment are time-consuming and often introduce human errors. To overcome these challenges, this study focuses on the optimization of hole positioning through the design and implementation of a custom-designed drill jig specifically developed for cylindrical components. The primary objective of this work is to improve positional accuracy, reduce setup time and enhance productivity during drilling operations. A drill jig was designed to firmly hold the cylindrical workpiece and guide the drill tool precisely to the required location. This study focuses on the optimization of hole positioning in cylindrical components by using a custom-designed drill jig to improve machining accuracy and productivity. Conventional drilling methods often lead to positional errors due to improper alignment and manual inaccuracies. To overcome these issues, an optimized drill jig was designed to provide accurate guidance and secure clamping of the cylindrical workpiece. The proposed jig ensures proper tool alignment, reduces human error and maintains consistent hole positioning during repeated operations.

Keywords: Drill Jig Design, Hole Positioning Accuracy, Cylindrical Component Machining, Drilling Operation, Optimization Jig Alignment and Repeatability in Machining.

Paper Id: A055

SIGNLINK: UNIVERSAL SIGN AND SPEECH SYSTEM

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ABSTRACT

The "Communication Deadlock" between the deaf and hearing communities remains a critical barrier to social and professional inclusion. Modern digital platforms often fail to accommodate the unique visual-spatial grammar of sign language. This project introduces SIGNLINK, a bi-directional, real-time translation system designed for multi-user environments, replacing expensive hardware with a seamless, software-defined bridge.

At the technical core of SIGNLINK is a Skeletal-Landmark architecture powered by MediaPipe. By extracting 21-point hand coordinates from a standard webcam feed, the system reduces complex video data into a 63-dimensional vector. This allows a Random Forest Classifier to achieve a 96.4% accuracy on standard CPUs, ensuring the system is both high-performing and democratically accessible.

A distinguishing feature is the Role-Based Smart Interface implemented in PyQt6, which provides tailored UI overlays for "Signers" and "Speakers." For hearing users, a Speech-to-Sign Avatar Engine maps spoken text to a sign language video library using the Google Translation API. To ensure fluidity, the networking layer utilizes a WebSocket Relay Hub, maintaining an end-to-end latency of 115ms. Ultimately, SIGNLINK proves that intelligent software design can replace bulky hardware to foster an equitable, connected world.

PAPER ID: A056

EXPLAINABLE PHISHING DETECTION USING BERT BASED NATURAL LANGUAGE PROCESSING AND SHAP-DRIVEN INTERPRETABILITY

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ABSTRACT

Phishing attacks are among the most consistent and destructive cybersecurity threats that manipulate social engineering and spoofed web infrastructure to compromise user credentials, financial assets, and organizational data. Traditional blacklist-based and rule driven detection methods have failed in the identification of newly emerging or obfuscated phishing campaigns due to their reliance on static signature- and keyword-based matching techniques. In regard to such challenges, this paper proposes a model of explainable and privacy preserving phishing detection, which has been developed with deep learning and interpretable artificial intelligence for the accurate and transparent identification of threats. The proposed system designs a dual stream architecture that considers the structural properties of the URL and email semantic intention simultaneously. A hybrid CNN– ANN model extracts character-level patterns and engineered domain features from URLs, while a transformer-based RoBERTa language model extracts contextual and behavioral cues from email text to detect advanced social engineering tactics. To reduce the impact of class imbalance and increase the detection of unique but high risk cases of phishing messages, a synthetic minority data generation technique is included within the framework. Furthermore, a Recursive Feature Elimination (RFE) technique is used for optimizing high dimensional URL features, reducing unnecessary noise and enhancing efficiency. Additionally, a feature attribution technique called SHapley Additive explanations (SHAP) is implemented for representation and facilitating the interpretation of results through feature-level explainability, assisting the system in justifying the prediction results in real-time. The proposed framework also implements the entire system within a localhost environment for data and privacy purposes. Furthermore, a chatbot function is included in the proposed framework, designed to ensure AI-driven security and cybersecurity awareness within the organization regarding phishing attacks. The results of the proposed system show enhanced accuracy and efficiency over traditional machine learning techniques. The proposed framework bridges the gap between the worlds of high-performance prediction and decision justification within the ecosystem of the proposed framework.

KEYWORDS: Phishing Detection, Explainable Artificial Intelligence (XAI), BERT-Based Natural Language Processing, SHAP Interpretability, Deep Learning Cybersecurity.

Paper Id: A057

Spleen Amaranth Extracts Loaded Carboxymethyl Cellulose Film for Wound Healing

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Abstract

The study investigates spleen amaranth (*Amaranthus dubius*) extracts loaded carboxymethyl cellulose (CMC) film for wound healing applications. Spleen amaranth is rich in bioactive compounds including flavonoids, phenolics, alkaloids, and vitamins, which confer antioxidant, anti-inflammatory, and antimicrobial properties. Presence of alkaloids, steroids, triterpenoids, proteins, and carbohydrates was confirmed by phytochemical screening of the spleen amaranth-loaded CMC films, while HPLC analysis revealed one major polar metabolite along with several minor constituents. Antimicrobial assays demonstrated inhibitory activity of the films against *Staphylococcus aureus* and *Escherichia coli*, thereby validating their antibacterial potential. Cytotoxicity evaluation showed concentration-dependent effects, with cell viability remaining above 80% even at 150 µg/mL, indicating low toxicity and biocompatibility. FTIR spectra confirmed functional groups consistent with polysaccharide derivatives, while FESEM analysis revealed smooth polymer matrices with localized cracks and particulate inclusions, highlighting both uniform film formation and structural defects. Energy-dispersive X-ray spectroscopy verified the organic nature of the films, with sodium salts contributing to solubility. Thermogravimetric analysis indicated three distinct mass-loss phases, reflecting moisture evaporation and polymer degradation. Collectively, these multidisciplinary evaluations demonstrate that spleen amaranth loaded CMC films possess structural integrity, phytochemical richness, antimicrobial activity, and biocompatibility, making them promising candidates for wound care applications. The findings suggest that these films could serve as safe, natural, and effective biomaterials for managing infections and promoting tissue repair, while further fractionation and mechanistic studies are warranted to optimize therapeutic efficacy.

Keywords: *Amaranthus dubius*, carboxymethyl cellulose, wound healing, phytochemicals, biocompatibility.

Paper Id A058

GREEN SYNTHESIS OF HYDROPHILIC GLYCEROL-DISPERSED BIMETALLIC MAGNETIC NANOPARTICLES FOR RAPID AND EFFICIENT O-NITROPHENOL REDUCTION

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Abstract

Bimetallic nanoparticles have attracted significant attention due to their enhanced catalytic activity arising from synergistic metal–metal interactions. In the present study, Fe/Co bimetallic nanoparticles with molar ratios of 1:3 and 3:1 were successfully synthesized and explored as efficient catalysts for the reduction of o-nitrophenol. The structural, morphological, elemental, and magnetic properties of the synthesized nanoparticles were systematically characterized using UV–Visible spectroscopy, FT-IR, X-ray diffraction (XRD), scanning electron microscopy (SEM), energy-dispersive X-ray analysis (EDAX), and vibrating sample magnetometry (VSM). The catalytic reduction of o-nitrophenol was monitored by UV–Visible spectroscopy, where the gradual disappearance of the characteristic absorption peak confirmed the successful conversion. Among the two compositions, Fe/Co (1:3) exhibited superior catalytic performance, achieving complete reduction within 6 minutes. Kinetic analysis of the Fe/Co (1:3) system followed pseudo-first-order reaction kinetics with a high correlation coefficient ($R^2 = 0.9985$), confirming the efficiency and reliability of the catalytic process. These results highlight the potential of Fe/Co (1:3) bimetallic nanoparticles as effective catalysts for the rapid reduction of nitroaromatic compounds.

Keywords: Glycerol, Bimetallic nanoparticle, magnetic nanoparticle, o-nitrophenol

Paper Id: A059

Iot Enabled Smart Milk Adulteration Detection Device

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Abstract

Milk adulteration and poor milk quality have become major concerns affecting public health and consumer safety. Milk is an essential nutritional food widely consumed by people of all age groups, but the addition of water and harmful chemicals reduces its nutritional value and may lead to serious health problems. Conventional milk quality testing methods are mainly laboratory based and require complex equipment, skilled personnel and longer processing time. These methods are not suitable for real-time monitoring or on-site testing at households, dairy farms or milk collection centers. Therefore, there is a need for a portable and efficient milk quality monitoring system. This project proposes a Iot Enabled Smart Milk Adulteration Detection System using an ESP32 microcontroller. The ESP32 acts as the central processing unit that collects and processes data from multiple sensors used for milk quality analysis. The system monitors important milk parameters such as temperature, smell, water adulteration and overall milk quality. A temperature sensor is used to measure the milk temperature to maintain stability during testing. Total Dissolved Solids (TDS) sensors help detect dissolved substances in milk, which assists in identifying water dilution and other adulterants. The ESP32 processes the sensor data and displays the analyzed results on an LCD display, providing instant information about milk quality. The proposed system is a portable, low-cost and user-friendly solution for real-time milk quality monitoring and can be used by household users, dairy farmers and milk vendors to ensure safe milk consumption.

Keywords: IoT, ESP32 ,Temperature Sensor, TDS Sensor, LCD Display, Portable Device.

PAPER ID: A060

AUTOMATED PET HEALTH, FEEDING AND ACTIVITY MONITORING SYSTEM

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Abstract

The Automated Pet Health, Feeding and Activity Monitoring System is designed to provide continuous supervision and intelligent care for domestic pets using an embedded microcontroller based architecture. The system is developed using a microcontroller as the central control unit, which integrates multiple sensors and actuators to monitor pet activity, environmental conditions and feeding status in real time. A PIR motion sensor is employed to track the movement and activity patterns of the pet, enabling early detection of abnormal behavior or prolonged inactivity that may indicate health issues. An IR proximity sensor is used to monitor the food level in the feeding container, ensuring timely refilling and preventing underfeeding or overfeeding. Environmental conditions surrounding the pet are continuously measured using a temperature and humidity sensor, allowing the system to maintain a comfortable and safe living environment. An automated feeding mechanism, driven by a relay or motor driver circuit, dispenses food at predefined intervals. Similarly, a water pump or solenoid valve ensures regular water supply to the pet without human intervention. The microcontroller processes sensor data and executes control actions based on programmed logic, while an alert unit (notifications) notifies the owner during abnormal conditions such as low food levels, unusual inactivity or unfavorable environmental parameters. The proposed system minimizes manual effort, improves the reliability of pet care and enhances the overall health and well-being of pets.

Keywords : IoT, Embedded System, Microcontroller, Pet Monitoring, Automated Feeding, Sensors, Temperature and Humidity, Motion Detection, Water Supply, Smart Pet Care

PAPER ID: A061

EXPERIMENTAL STUDY OF MECHANICAL PROPERTIES OF AZ91D MAGNESIUM Al_2O_3 COMPOSITE UNDER COLD WORKING

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ABSTRACT

The present study focuses on the experimental investigation of the mechanical and tribological properties of an AZ91D magnesium alloy reinforced with Al_2O_3 particles under cold working conditions. The composite material was prepared and subjected to cold working to improve its mechanical performance. Hardness tests were conducted to evaluate the strength of the material after processing. The microstructure of the composite was analysed using Scanning Electron Microscopy (SEM) to examine the distribution of Al_2O_3 particles within the AZ91D magnesium matrix. X-ray Diffraction (XRD) analysis was performed to identify the phases present in the composite. Wear tests were carried out to evaluate the wear behaviour of the material and the worn surfaces were further examined using SEM to understand the wear mechanisms. The results show that the addition of Al_2O_3 reinforcement and cold working significantly improves the hardness and wear resistance of the AZ91D magnesium composite.

Keywords - AZ91D Magnesium Alloy, Al_2O_3 Reinforcement, Metal Matrix Composite (MMC), Cold Working, Mechanical Properties, Hardness Test, scanning Electron Microscopy (SEM), X-ray Diffraction (XRD) and Microstructural Analysis.

Paper Id: A062

FOODSTAGRAMMING: A STUDY ON WHY CUSTOMERS TAKE PHOTOS OF FOOD IN CAFÉS BEFORE EATING

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ABSTRACT

In recent years, social media platforms such as Instagram and Snapchat have changed the way people share their daily experiences. One noticeable trend is the habit of taking photographs of food before eating, especially in cafés and restaurants. Customers often capture and share images of aesthetically presented dishes on social media, a practice popularly known as “foodstagramming.” This behavior has become an important aspect of modern consumer culture. For many customers, sharing food photos is a way to express lifestyle, social identity, and personal experiences. From a marketing perspective, these photos also act as free promotion for cafés and restaurants because they reach a wide audience online. Understanding why customers take photos of food before eating can provide useful insights for café owners and marketers. It can help them improve food presentation, customer experience, and social media engagement strategies.

The growing influence of social media has significantly changed customer behavior in the food and hospitality industry. Many café customers now prefer to photograph their food before eating and share it online. However, the reasons behind this behavior and the factors that encourage it are not always clearly understood.

Paper Id: A063

INTELLIGENT LOAD PRIORITY CONTROLLER FOR BROWNOUT PROTECTION

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Abstract:

Voltage fluctuation and brownout conditions in residential electrical systems can damage household appliances and reduce their lifespan. To address this problem, an Intelligent Load Priority Controller for smart homes is proposed to protect essential appliances during low-voltage situations. The system monitors supply voltage using a ZMPT101B voltage sensor and measures load current through an ACS712 current sensor. Sensor data is processed by a microcontroller implementing a priority-based algorithm for effective load management. During brownout conditions, non-essential loads are automatically disconnected while essential appliances continue operating to ensure uninterrupted performance. A two-channel relay module controls load switching based on voltage conditions and priority levels. The system also monitors current to prevent overloading and improve energy efficiency. A prototype smart home model is developed to demonstrate system operation. The controller allows user-defined priority settings and provides status indications for voltage and load conditions. The proposed design enhances appliance safety improves power reliability and supports smart home automation development.

Keywords: Smart Home Automation, Load Priority Controller, Voltage Monitoring, Brownout Protection, Microcontroller, Energy Efficiency, Relay Control.

Paper Id: A064

Compact Meander-Line Antenna Design For ISM Band Applications

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Abstract

In this paper, the design, simulation, fabrication and experimental validation of a small meander-line microstrip patch antenna in Industry, Scientific and Medical (ISM) band applications at 2.3 GHz is presented. In use in wireless communication systems since many years ago, conventional rectangular microstrip patch antennas have limitations such as large physical size, limited bandwidth and inability to obtain sufficient gain in current IoT and wireless systems. In order to solve these problems, the meander-line method is used to make the effective electrical length of current path within a smaller physical size, which then allows the size to be simultaneously smaller and the performance be improved. The proposed antenna is developed on a felt substrate, which has a low dielectric constant, which helps to enhance the radiation efficiency and decrease the return loss. The antenna structure of the patch dimension is 50x50 mm and it is simulated through CST (Computer Simulation Technology) software optimizing key performance parameters. The simulation findings indicate a return loss (S₁₁) of -21.76 dB at 2.3098 GHz, VSWR 1.20 and the highest gain of 13.60 dBi. The obtained fabricated prototype, which is tested with a Vector Network Analyzer (VNA) is giving a measured S₁₁ of -23.15 dB at 2220.78 MHz, which closely agrees with simulation values, and which proves validity of the design. The small design suggested has good impedance and high gain behavior that makes it a potential candidate in the application in modern wireless communication and IoT devices that can be used in the ISM band.

Keyword: Meander-Line Antenna, ISM Band, Microstrip Patch Antenna, CST Simulation, Return Loss, IoT Applications.

Paper Id: A065

A Deep Convolutional Neural Network-Based Approach for Accurate Image Classification and Feature Extraction in Digital Image Processing.

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Abstract

Digital image processing has become an essential component in many applications such as medical imaging, security surveillance, remote sensing, and automated inspection systems. Traditional image processing techniques often rely on manual feature extraction methods, which may limit accuracy and efficiency when dealing with large and complex image datasets. To address these challenges, deep learning techniques, particularly Convolutional Neural Networks (CNNs), have emerged as powerful tools for automatic feature extraction and image classification.

This paper proposes a deep convolutional neural network-based approach for accurate image classification and feature extraction in digital image processing. The proposed model automatically learns hierarchical features from input images, reducing the need for manual feature engineering. The architecture consists of multiple convolutional layers, pooling layers, and fully connected layers that enable efficient feature learning and classification. Image preprocessing techniques such as normalization and resizing are applied to improve the model's performance and stability.

The proposed method is evaluated using standard image datasets, and the experimental results demonstrate improved classification accuracy and robust feature extraction compared to conventional image processing techniques. The model shows better generalization capability and efficiency in handling large-scale image data. The results highlight the effectiveness of deep learning-based approaches in enhancing the performance of digital image processing systems.

The study concludes that deep convolutional neural networks provide a reliable and scalable solution for automated image classification and feature extraction, making them suitable for various real-world applications in intelligent image analysis.

Paper ID: A066

Understanding Switching Intentions from Quick Commerce to Eco-Commerce Using the Push– Pull– Mooring Framework Approach

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Abstract

The rapid growth of online shopping, accelerated by quick commerce (q-commerce) platforms offering ultra-fast deliveries, has significantly transformed consumer purchasing behavior. However, these services contribute to serious environmental concerns, including excessive single-use packaging and high energy consumption, raising questions about their long-term sustainability. In response, eco-commerce models have emerged, promoting environmentally responsible practices such as sustainable packaging, ethical sourcing, and reduced ecological impact. This study examines the factors influencing consumers' intention to switch from conventional q-commerce platforms to eco-commerce platforms by applying the Push– Pull–Mooring (PPM) framework. The model incorporates push factors such as perceived risk and environmental concern, pull factors including economic benefits and independence, and mooring factors such as switching cost, self-perceived knowledge, subjective norms, and habit, which collectively influence switching behavior. A quantitative research design was adopted, and data were collected through a structured questionnaire administered to active users of digital retail platforms. The data were analyzed using Variance-Based Structural Equation Modeling (PLS-SEM) with SmartPLS. The study extends the application of the PPM framework to the context of eco-commerce adoption and emphasizes the role of consumer awareness, habit disruption, and perceived autonomy in facilitating sustainable switching behavior. The findings provide valuable insights for eco-retailers, marketers, and policymakers to promote sustainable digital retail through informed strategies and consumer engagement initiatives.

Keywords: Quick Commerce, Eco-Commerce, Push–Pull–Mooring Framework, Consumer Behaviour, Sustainability

Paper Id: A067

Gen Z Brand Loyalty in a Changing Consumer Landscape: The Role of Experiential Engagement vs Transactional Incentives

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Abstract

Generation Z (Gen Z) consumers represent a rapidly emerging and influential segment in the contemporary consumer market, characterized by strong digital engagement, value-driven consumption behaviour, and a preference for authentic brand interactions. Traditional approaches to building brand loyalty have largely relied on transactional incentives such as discounts and reward programs; however, evolving consumer expectations necessitate a deeper understanding of experiential engagement factors. This study aims to examine the key determinants of brand loyalty among Gen Z consumers, with a specific focus on comparing the influence of experiential engagement factors and transactional incentives. A quantitative research design was employed using a structured questionnaire administered to 151 respondents, and the data were analysed using correlation analysis in IBM SPSS. The findings indicate that digital behaviour variables, including online research and social media influence, demonstrate significant relationships with brand loyalty. Transactional incentives such as discounts and reward programs also show statistically significant but relatively weaker relationships. Among experiential factors, social media engagement and brand transparency exhibit significant associations with loyalty, while personalization and community participation show limited influence. Furthermore, the results reveal that consumers who prioritize experiential value over discounts tend to demonstrate higher loyalty levels. The study concludes that Gen Z brand loyalty is shaped by a combination of digital engagement, experiential value, and transactional incentives, with increasing emphasis on experience-driven and digitally mediated brand relationships.

Keywords: Gen Z, Brand Loyalty, Experiential Engagement, Transactional Incentives, Social Media, Consumer Behaviour

Paper Id: A068

Understanding Switching Intentions Toward Renewable Energy Adoption Among MSMEs Using the Push–Pull–Mooring Framework: Evidence from Emerging Indian Markets

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Abstract

The transition to renewable energy has become a global priority as nations strive to address rising energy demand and environmental concerns. In emerging economies like India, Micro, Small, and Medium Enterprises (MSMEs) play a crucial role in economic activity and energy consumption. Despite increasing policy support and technological advancements, the adoption of renewable energy among MSMEs remains limited. This study investigates the factors influencing switching intentions toward renewable energy adoption using the Push–Pull–Mooring (PPM) framework.

A quantitative research approach was adopted, and data were collected through structured questionnaires from MSME owners and managers. The analysis was conducted using Structural Equation Modeling (SEM) with SmartPLS. The study considers push factors such as perceived risk and environmental concern, pull factors including economic benefits and independence, and mooring factors such as switching costs, knowledge, and subjective norms.

The findings indicate that economic benefits and concerns regarding the reliability of conventional electricity significantly drive switching intentions. However, high installation costs and lack of awareness act as major barriers. The model demonstrates strong explanatory power, accounting for approximately 70% of the variance in switching intentions ($R^2 = 0.706$).

The study provides valuable insights for policymakers and industry stakeholders to design targeted financial incentives, awareness programs, and supportive policies to accelerate renewable energy adoption among MSMEs in emerging markets.

Keywords: Renewable Energy, MSMEs, Switching Intention, Push–Pull–Mooring, SmartPLS, SEM

Paper Id: A069

REVIEW ON TYPES OF SENSORS FOR HEALTH MONITORING

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Abstract

Everyone is now need to monitor their health in order to continuously track their physical state and identify medical issues early on. Since sensors are always gathering real-time data from the human body, they are essential for monitoring one's health. The majority of wearable gadgets currently available, such as smart watches and rings, include health monitoring sensors such as heart rate and temperature sensors. In the realm of routinely utilized equipment in health monitoring, this review publication discusses motion sensors, blood pressure sensors, ECG (electrocardiogram) sensors, SpO2 (peripheral oxygen saturation) sensors, temperature sensors, and heart rate monitors. Despite advancements in sensing technology, these are still useful for medical rehabilitation, sports monitoring, and human well-being. Because these sorts of health monitoring equipment enable continuous, non-invasive evaluation of biological and biophysical signals directly on the body, they are able to monitor real-time data of the human body. These sensors are used to continuously and accurately monitor pressure, temperature, motion, stress, oxygen levels, and pulse in the human body, assisting with diagnosis, therapy, and preventative care. This research also highlights the importance of selecting the right sensors for specific medical applications and discusses how they contribute to improving patient safety and quality of life. This evaluation highlights the crucial role of sensors in contemporary medical treatment and the development of medical technology that employs sensors.

Keywords: Health monitoring, Sensors, Wearable Devices, Heart Rate, SpO2, ECG, IoT, Remote Monitoring

Paper Id: A070

Women Safety Chatbot

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Abstract

The rapid growth of technology has opened new avenues for enhancing personal safety, especially for women. This project presents the design and development of a Women Safety Chatbot aimed at providing immediate assistance and support during emergency situations. The chatbot is integrated with intelligent conversational capabilities to interact with users in real time and guide them through safety measures. The system allows users to quickly access emergency services, share their live location with trusted contacts, and receive safety tips based on their situation. It can also provide information about nearby police stations, hospitals, and helpline numbers. The chatbot uses Natural Language Processing (NLP) techniques to understand user queries and respond effectively. Additionally, the chatbot can be integrated into mobile or web applications, making it easily accessible. It is designed to function efficiently with minimal user interaction, ensuring quick response during critical situations. The main objective of this system is to enhance women's safety by providing a reliable, fast, and user-friendly digital assistant. In conclusion, the Women Safety Chatbot serves as a proactive tool that leverages technology to promote security, awareness, and confidence among women in society. Future enhancements may include voice recognition, offline functionality, and AI-based threat detection for improved performance.

Keywords: Chatbot ,Emergency Assistance ,Natural Language Processing (NLP) ,Artificial Intelligence (AI) ,Real-Time Communication ,Location Tracking ,Safety Alerts ,Mobile Application ,Web Application ,User Interaction ,Crime Prevention ,SOS System ,Digital Safety ,Smart Assistance

Paper Id: A071

Workplace Safety Culture and its Impact on Employee Skill Development

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Abstract

Workplace safety culture has gained increasing importance in organizations, particularly in manufacturing industries where employees are exposed to various operational risks and safety challenges. This study aims to examine how workplace safety culture influences employee skill development within an organizational setting. The research focuses on key elements of safety culture such as safety policies, training programs, management commitment, communication, and employee participation in maintaining a safe working environment. The study also highlights the importance of moving beyond simple compliance with safety regulations toward building a culture that supports continuous learning and capability development among employees. A quantitative research design was adopted, and primary data were collected through a structured questionnaire distributed to employees working in different departments of the organization. Statistical tools such as percentage analysis, descriptive statistics, correlation analysis, and regression analysis were used to analyze the collected data and examine the relationship between workplace safety culture and employee skill development. The findings reveal that a positive safety culture significantly enhances employees' awareness, technical knowledge, and problem-solving abilities. Furthermore, continuous safety training and strong management support help employees improve their competencies and confidence in handling workplace tasks effectively, thereby contributing to improved individual performance and overall organizational productivity.

Keywords: Workplace Safety Culture, Employee Skill Development, Safety Training, Management Commitment, Communication, Organizational Productivity.

Paper Id: A072

ORAL CANCER DETECTION USING DEEP LEARNING

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Abstract

Oral cancer is one of the most common and life-threatening diseases worldwide, particularly in countries with high tobacco and alcohol consumption. Early detection plays a critical role in improving patient survival rates, yet traditional diagnostic methods often rely on manual examination and biopsy, which can be time-consuming and dependent on specialist expertise. This study proposes a deep learning-based approach for the automated detection of oral cancer using medical images of the oral cavity.

The proposed system utilizes **Convolutional Neural Networks (CNNs)** to analyze and classify images into cancerous and non-cancerous categories. The model is trained on a dataset of oral lesion images, where deep learning algorithms automatically extract relevant features such as texture, color variations, and abnormal tissue patterns. Data preprocessing and augmentation techniques are applied to improve model performance and generalization.

Experimental results demonstrate that the deep learning model can achieve high accuracy in detecting potential oral cancer cases, assisting healthcare professionals in early screening and diagnosis. This approach can serve as a supportive diagnostic tool, reducing the burden on medical experts and enabling faster and more accessible detection. Ultimately, the integration of artificial intelligence in medical imaging has the potential to significantly enhance early diagnosis and improve patient outcomes.

Keywords: Oral Cancer, Deep Learning, Medical Image Analysis, Convolutional Neural Networks (CNN), Early Cancer Detection, Artificial Intelligence in Healthcare, Image Classification, Computer-Aided Diagnosis, Medical Imaging, Oral Lesion Detection

Paper Id: A073

An Intelligent Web-Based Platform for Integrated Nutritional Management and Digital Food Procurement: The Diet Dash

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Abstract

In today's era, many people have moved to cities and started living an advanced lifestyle. People in a fast-moving world often do not think about their health. They do not think about things like what foods they are restricted to, what allergies they have, or what their fitness goals are.

To fix this problem, we created Diet Dash. It is a web-based platform that helps people maintain their health properly by ordering food online. It takes data from the user, such as their age, gender, height, weight, and body mass index. It also takes information about the users' food preferences, like vegetarian, vegan, and more; allergies; and what users want to achieve.

Using this information, our system suggests meals to users. We have a database of meals with their information, which includes calories, fats, nutrition, and so on. This makes it easy for users to track their goals. We built Diet Dash using a full-stack technology called MERN. We also used a rule-based model to create models that support our system and data processing.

The result we found through our system is that people are more aware of what they want to eat, they do not have to work hard to keep track of their calories, and they are more engaged with eating healthy foods.

Keywords: Artificial Intelligence, Personalized Nutrition, Food Delivery Systems, Diet Tracking, MERN Stack, Rule-Based AI, Digital Health, Nutritional Management

Paper Id: A074

Development of the Mini Ultrasound Therapy Device

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Abstract

Ultrasound therapy has gained significant importance in modern medical and physiotherapy applications due to its non-invasive nature and effectiveness in pain management and tissue healing. This project presents the design and development of a mini ultrasound therapy device that is compact, cost-effective, and suitable for portable healthcare applications. The device utilizes high-frequency sound waves to penetrate soft tissues, promoting blood circulation, reducing inflammation, and accelerating the healing process. With the increasing demand for home-based medical devices and wearable healthcare solutions, miniaturized therapeutic systems play a vital role in improving accessibility and convenience for patients.

This study focuses on the working principles of ultrasound generation, system design, and implementation of essential electronic components required for efficient operation. The proposed device integrates a signal generator, amplifier circuit, and ultrasound transducer to deliver controlled therapeutic output. Additionally, safety considerations, frequency optimization, and power efficiency are discussed to ensure reliable performance. The project also highlights the potential applications of the device in physiotherapy, sports injury treatment, and pain relief therapies. Furthermore, the advantages, limitations, and future enhancements of mini ultrasound therapy devices are explored to support advancements in portable medical technology.

Keywords: Ultrasound Therapy, Transducer, Physiotherapy, Portable Device, Pain Management, Medical Electronics

Paper Id: A075

Advancing Heart Disease Prediction Using Hybrid Machine Learning Models and Class Imbalance Techniques

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Abstract

Healthcare is essential to human survival, and "heart disease" encompasses a range of conditions affecting the heart and blood vessels. Early diagnostic methods are essential for cardiovascular problems in order to identify high-risk individuals and reduce consequences. This paper suggests a novel hybrid model that combines Deep Neural Networks (DNN) with eXtreme Gradient Boosting (XGBoost) to predict heart disease in order to get around problems like outliers, missing data, and class imbalance. By employing the ROSE (Random Over-Sampling Examples) technique for dataset balance, the hybrid model achieved an outstanding accuracy of 99.01%, surpassing that of traditional machine learning models. These findings demonstrate the potential of the proposed approach to provide a reliable, non-invasive, and cost-effective early diagnosis of cardiac disease.

Keywords: - Heart disease, machine learning, XGBOOST algorithm, feature selection

Paper Id: A076

Load Cell Based Intelligent Parking System

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ABSTRACT

Urban parking congestion remains a critical infrastructure challenge, with empirical evidence indicating that drivers waste an average of 14-30 minutes per visit searching for available parking spaces, resulting in unnecessary fuel consumption, environmental pollution, and traffic congestion. This paper presents a cost-effective IoT-enabled Smart Parking Management System that autonomously detects vehicle presence and dynamically manages parking space availability through distributed sensor fusion and real-time edge computing. The proposed system architecture comprises three sequential operational phases: (1) Vehicle Entry Detection, wherein an infrared sensor deployed at the parking area entrance detects approaching vehicles and triggers automated gate opening via SG90 servo actuation within 1.2 seconds while concurrently decrementing the available slot counter; (2) Occupancy Verification, wherein a load cell sensor embedded beneath each parking surface measures vehicle mass and transmits precision weight data to an ESP32 microcontroller, which confirms occupancy status and updates both local LCD display and cloud-synchronized mobile application interfaces; (3) Vehicle Departure Confirmation, wherein an exit-positioned infrared sensor detects vehicle departure and automatically marks the parking slot as available. The innovation of this work resides in the hybrid sensor fusion approach combining infrared vehicle detection with load cell weight-based occupancy classification, thereby achieving superior accuracy and reliability compared to single-sensor implementations. While traditional IR-only parking systems achieve accuracy rates of approximately 87%, the proposed dual-sensor methodology achieves 95.8% accuracy under varying meteorological conditions, including heavy rainfall and monsoon weather, where single-sensor approaches demonstrate significant performance degradation. The system demonstrates scalable architecture suitable for diverse deployment scenarios ranging from discrete 50-slot campus installations to municipal-scale 5,000-slot parking networks without requiring architectural modification. The hybrid edge-cloud design enables autonomous local decision-making during internet disconnection while maintaining cloud scalability advantages for centralized data synchronization and analytics.

Keywords: Smart Parking, Sensor Fusion, Vehicle Detection, Load Cell Classification, Infrared Sensing, ESP32 Edge Computing, Occupancy Monitoring, IoT Infrastructure, Automated Gate Control, Urban Mobility Solutions

Paper id : A077

MULTIMODAL AUDITORY INTERFACE INTEGRATION FOR AUTONOMOUS FINANCIAL INTERACTION IN VISUALLY IMPAIRED-CENTRIC ATM ARCHITECTURES

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ABSTRACT

Access to banking services is essential for all individuals, yet visually impaired users often encounter difficulties when interacting with conventional Automated Teller Machines (ATMs) due to their dependence on visual interfaces. To address this limitation, a voice-guided ATM system is designed to support blind users by providing structured audio instructions that guide them through various banking operations. The proposed system integrates speech recognition and text-to-speech technologies to enable effective human-machine interaction without requiring visual input. In this framework, the Hidden Markov Model (HMM) is employed for accurate speech recognition by analyzing sequential voice patterns, while an Artificial Neural Network (ANN) is utilized to enhance command classification and decision-making processes within the system. Through this combination of algorithms, the system can interpret user voice commands and execute ATM functions such as cash withdrawal, balance inquiry, and fund transfers efficiently. Furthermore, the system incorporates biometric authentication using fingerprint recognition to ensure secure user verification before granting access to banking services. The voice interface is designed with multilingual capabilities and adjustable audio output levels to accommodate users from different linguistic backgrounds and hearing preferences. Error detection and validation mechanisms are also integrated to identify incorrect inputs and guide users through corrective steps, thereby reducing the likelihood of transaction failures. By combining HMM-based speech processing, ANN-driven decision support, and biometric security, the voice-guided ATM system provides a reliable and accessible banking solution. This technology enables visually impaired individuals to perform financial transactions independently while maintaining privacy, security, and ease of use, thereby contributing to greater inclusivity within modern banking infrastructures.

Keyword: Voice-Guided ATM, Visually Impaired Users, Speech Recognition, Hidden Markov Model (HMM), Artificial Neural Network (ANN), Biometric Authentication, Fingerprint Recognition, Text-to-Speech Technology, Accessible Banking Systems, Human-Computer Interaction.

Paper Id: A078

Real-Time Driver Drowsiness Detection System Using Computer Vision and Deep Learning

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Abstract

Driver drowsiness is a significant contributor to road accidents and demands reliable real-time monitoring systems to enhance transportation safety. This project proposes a real-time Driver Drowsiness Detection System that integrates computer vision and deep learning techniques for continuous driver state analysis. Live video frames acquired from a webcam are preprocessed and analyzed using Haar Cascade classifiers to detect facial features and localize eye regions. The extracted eye images are normalized and fed into a Convolutional Neural Network (CNN) trained to perform binary and multi-class eye state classification. Temporal smoothing and sliding window analysis are applied to reduce false positives caused by normal eye blinking and sudden head movements. A time-based thresholding mechanism differentiates between active, closed, and drowsy states by measuring the duration of eye closure. User-specific calibration is incorporated to dynamically adjust confidence thresholds, improving model generalization across different users and environmental conditions. The system operates in real time with minimal latency and provides continuous visual feedback along with audio-based warning and alarm signals to alert the driver. This architecture delivers an efficient, scalable, and low-cost solution for real-time driver fatigue detection and accident prevention.

Keywords: Driver Drowsiness Detection, Computer Vision, Convolutional Neural Network,

Temporal Analysis, Eye State Classification, Real-Time Systems, Human Alertness Monitoring, Road Safety

Paper Id: A079

**STRUCTURAL ANALYSIS AND PERFORMANCE
EVALUATION OF AN ANGLE HOLE FIXTURE FOR
CYLINDRICAL BUSH COMPONENTS IN THREE
AXIS VERTICAL MACHINING CENTRE**

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ABSTRACT

Fixtures are essential in machining operations to ensure proper positioning, clamping, and accuracy of components. This project focuses on the structural analysis and performance evaluation of an angle hole fixture used for machining cylindrical bush components in a three-axis Vertical Machining Centre (VMC). The fixture is designed to hold the cylindrical workpiece securely while enabling precise drilling of angled holes. Computer-Aided Design (CAD) is used to develop the fixture model with accurate dimensions. Structural analysis is performed using Finite Element Analysis (FEA) to study stress distribution and deformation under machining forces. The performance of the fixture is evaluated based on machining accuracy, clamping efficiency, and ease of operation. The study demonstrates that an optimized fixture design improves machining quality, reduces setup time, and enhances productivity.

Keywords - Fixture Design, Structural Analysis, Cylindrical Bush, Vertical Machining Centre (VMC), Finite Element Analysis (FEA).

Paper Id: A080

NEUROCHECK: An Intelligent Medication Adherence and Monitoring System for Neurorehabilitation Patients

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Abstract

Neurological rehabilitation patients require strict and timely medication schedules to support recovery and prevent complications. However, in busy hospital environments, nurses managing multiple patients may unintentionally miss or delay medication doses. To address this challenge, NEUROCHECK is developed as an IoT-based smart medication monitoring system designed specifically for neurological rehabilitation hospitals to assist nurses in ensuring accurate and timely drug administration. The system integrates a clinical software platform and a mobile application through which doctors prescribe medicines and schedule dosage timings digitally. These prescriptions are synchronized with a smart embedded medication device that generates automated alerts at the prescribed time. When the alert is activated, nurses administer the medication, and the device verifies tablet intake using integrated sensor technology. The medication status is automatically updated on a centralized dashboard, enabling doctors and hospital staff to monitor patient adherence in real time. To further enhance monitoring, Artificial Intelligence (AI) and Data Science techniques analyze medication adherence patterns, identify missed or delayed doses, and provide insights to support clinical decision-making. By combining IoT monitoring, sensor-based verification, real-time data synchronization, and intelligent analytics, NEUROCHECK improves medication adherence, reduces human error, and enhances patient safety in neurological rehabilitation care.

Keywords: Medication adherence, Neurological rehabilitation, Internet of Things (IoT), Smart healthcare, Artificial Intelligence, Data analytics, Real-time monitoring.

Paper Id: A081

OPTIMIZE KEY PARAMETER FOR PACAKET DELIVERY RATIO LATENCY, THROUGHPUT AND ROUTING OVERHEAD

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ABSTRACT

Efficient data transmission is a fundamental challenge in modern communication networks, particularly in dynamic and large-scale environments such as wireless ad hoc, vehicular, and Internet of Things (IoT) networks. The performance of routing protocols is commonly evaluated using critical Quality of Service (QoS) parameters including Packet Delivery Ratio (PDR), latency, throughput, and routing overhead. Optimizing these parameters simultaneously remains a complex task due to network congestion, mobility, and limited bandwidth. This research focuses on the optimization of key network performance parameters to enhance the reliability and efficiency of packet delivery. A traffic-aware and adaptive routing approach is proposed that dynamically adjusts routing decisions based on network conditions such as node density, link stability, and traffic load. The proposed framework integrates intelligent path selection mechanisms to reduce packet loss, minimize end-to-end delay, and improve throughput while controlling routing overhead. Simulation experiments are conducted using standard network simulation environments to evaluate the effectiveness of the proposed model. The results demonstrate that the optimized routing strategy significantly improves packet delivery ratio and throughput, while reducing latency and routing overhead compared with conventional routing techniques. The proposed methodology provides a scalable and efficient solution for next-generation communication networks and can be further extended through the integration of machine learning and real-time traffic prediction techniques.

Paper Id: A082

Customer Payment preferences and their impact on future spending behaviour

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Abstract

The rapid growth of digital payment systems has significantly transformed consumer transaction behaviour. This study examines customer payment preferences and their impact on future spending behaviour, focusing on the shift from cash to digital payment methods and how these choices influence spending awareness and frequency. The purpose of the study is to understand the factors driving payment method preferences and to analyze whether the convenience of digital payments affects consumers' future spending patterns. The study adopts a descriptive research design to analyze consumer payment behaviour. Primary data was collected through a structured questionnaire distributed online, consisting of questions related to payment preferences, transaction frequency, spending awareness, and financial monitoring habits. A total of 100 respondents participated in the survey using a convenience sampling method, covering different age groups and occupations. The collected data was analyzed using percentage analysis and pivot-based comparisons to identify trends in payment behaviour and spending patterns. The findings indicate a strong preference for digital payment methods among respondents. Approximately 77% of respondents reported using digital payments as their most frequent payment method, while only 4% primarily relied on cash. Digital payments are widely used even for smaller transactions, with 79% preferring digital methods for small-value purchases and 88% preferring digital payments for large-value transactions. Furthermore, 87–88% of respondents agreed that digital payments are faster and more convenient than cash, highlighting convenience and transaction speed as major drivers of adoption. However, the results also suggest behavioral implications associated with digital payments. Around 80% of respondents reported making more frequent payments when using digital methods, indicating that ease of transactions may increase spending frequency. At the same time, a majority of respondents agreed that cash transactions make individuals more careful while spending and increase awareness of the value of money, suggesting that physical cash promotes stronger spending discipline. The study contributes to understanding how evolving payment technologies influence consumer financial behaviour. While digital payments offer convenience, speed, and better transaction tracking, they may also encourage more frequent spending due to reduced psychological barriers to payment. The findings highlight the need for payment systems and financial applications that combine the convenience of digital transactions with tools that help users maintain spending awareness and financial discipline. This research provides insights for financial institutions, policymakers, and digital payment platforms in designing systems that support both transaction efficiency and responsible consumer spending behaviour.

Keywords: Cash payments, Digital payments, spending behaviour, over spending, ease of use, transaction frequency, payment preferences, convenience.

Paper Id:A083

A Study on the SERVQUAL Model in Online Food Delivery Services in Tamil Nadu

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Abstract

Online food delivery services have become an integral part of modern consumer lifestyles due to their convenience and accessibility, with platforms such as Swiggy and Zomato enabling users to order food easily through mobile applications. This study aims to examine service quality dimensions in online food delivery services using the SERVQUAL model, along with value-oriented factors such as time-saving orientation and price-saving orientation in Tamil Nadu. The study is based on primary data collected from 260 valid respondents using a structured questionnaire with a five-point Likert scale. The SERVQUAL framework was used to measure dimensions such as reliability, responsiveness, assurance, empathy, and tangibility. Statistical tools including reliability analysis, independent sample t-test, and one-way ANOVA were applied using SPSS software. The overall reliability value obtained for the scale was 0.646, indicating acceptable internal consistency. The findings reveal that service quality dimensions **play an important role in shaping user perception**, income level significantly influences time-saving orientation, and there is a significant difference in price-saving orientation between users of different online food delivery platforms. The study concludes that improving service quality and focusing on value-oriented factors can enhance user experience and competitiveness in the online food delivery market.

Keywords: Service Quality, Online Food Delivery, SERVQUAL Model, E-Service Quality, Digital Platforms, Consumer Behaviour, Mobile Commerce, Pricing Perception, SPSS Analysis.

Paper Id: A084

Implementation of 5S Methodology to Improve Workplace Organization and Operational Efficiency in a Yarn Dyeing Industry

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Abstract

The research question that will be addressed is the manner in which 5S methodology could be applied in enhancing workplace organisation and efficiency of operations of a textile yarn dyeing organisation. Some of the problems that many small and medium textile enterprises experience normally are improper storage of the yarns and materials, inability to find the required items, poor utilisation of workspace, and time wastage in the process of operation. To address these problems, the researchers implemented the five fundamental principles of 5S approach namely: Sort, Set in Order, Shine, Standardise, and Sustain in the organisation. A qualitative study of organisational records like stock registers, order books, and delivery logs as well as qualitative observations and interviews with employees were used through a descriptive approach of case study. The researchers contrasted the pre- and post-intervention conditions of workflow and workplace, especially in the area of storing the yarn and the arrangement of materials and cleanliness. The materials were categorised, labelled, and organised in a better way after 5S implementation and became easier to retrieve and work on. The findings indicated great enhancement of workplace organisation, efficiency of operations and productivity of employees. The descriptive statistical analysis showed increased mean values in most performance variables after the implementation, and paired-sample t-tests detected statistically significant differences in many of the variables in the operational indicators. On the whole, this research proves that the 5S methodology can be considered an efficient and useful tool that allows eliminating waste, optimising the processes of organisation in the work environment, and increasing the performance of operations in the textile yarn dyeing institutions.

Keywords: 5S Methodology, Workplace Organization, Lean Management, Operational Efficiency, Textile Industry.

Paper Id: A085

Activity based ADHD Detection

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Abstract

Attention -Deficit/Hyperactivity Disorder (ADHD) is often under-diagnosed in its initial phases in spite of its commonality in different age groups. Little signs of neurocognitive variance may be impaired sustained attention, inconsistent arousal, disorganized mental functioning, or inability to finish tasks. However, the traditional assessment modalities are mostly based on structured interviews, observational verdicts, and self-reported symptoms that are captured in clinical interaction. Such traditional approaches might not help to recapture real time behavioural dynamics hence creating delays in diagnosis and intervention. This type of diagnostic delay may have a negative influence on academic achievement, performance in the job, and general health. The paper introduces a different, task-based digital screening paradigm that is designed in a manner that assesses cognitive functioning in an interactive format, simulated on quotidian demands. The system does not only focus on diagnostic labels, or symptom checklists, but in fact, it records the fundamental cognitive domains, such as sustained attention, working memory, perceptual processing, response to distraction, and adaptive reasoning. Science-based challenges designed in a gamified format encourage participants to be active but at the same time, collect organized performance indicators on the periphery. Each of the sessions is subject to the application of computational modeling that combines the concepts of cognitive science and machine learning to help identify subtle behavioural patterns in diverse age groups and backgrounds, reducing the subjective influence. The system then produces a succinct and accessible overview that illustrates possible ADHD-related signs and symptoms in addition to personal cognitive abilities. This is an attempt to enhance the early detection process and offer supportive value to parents, educators and clinicians by integrating engagement, objective measurement with data-driven analysis. Finally, interactive digital assessment coupled with evidence-based analytics may help add to more timely, fair, and reliable routes to understanding attention-associated differences and the advice of proper support measures.

KEYWORDS: Deficit/Hyperactivity Disorder (ADHD), digital screening, cognitive assessment, early detection, machine learning, gamified assessment.

Paper Id: A086

Fibre optic concentration sensor

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Abstract

This paper reports the principle of operation, the design aspects, experimentation and performance of a fibre optic probe for sensing the variation of refractive index with concentration of glycerol in distilled water. The device consists of fibre optic transmitter, fibre optic probe, reflective surface, temperature controller, photodiode detector and a digital multimeter. The variations in refractive indices of glycerol for a range of concentrations varying from distilled water are studied. For glycerol, a concentration changes from 0 to 50 ml per 100 ml produce a refractive index change from 1.3321 to 1.4021. Correspondingly the displacement corresponding to peak voltage changes by 987 μm and maximum variation detected in output voltage is 192 mV. The results show that the displacement corresponding to maximum intensity observed at different concentrations is a function of the refractive index of the medium and there is a linear relationship between them. From the experimental results it is concluded that as the concentration or density of a solute increases, the refractive index increases proportionately. The stability of the sensor, high sensitivity and the simplicity of the design, low cost of fabrication, make it suitable for chemical, biomedical, pharmaceutical and process control applications.

Keywords: fibre optic sensor, polymer optical fibre, glycerol, concentration sensor

PAPER ID : A087

BREATHE GUARD (Integrated Multi-Sensor Device for Early Detection and Monitoring of Respiratory Diseases)

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ABSTRACT

Respiratory diseases such as asthma, chronic obstructive pulmonary disease (COPD), pneumonia, and other breathing disorders pose significant health challenges worldwide. Continuous monitoring of respiratory parameters and environmental conditions plays an important role in the early detection and effective management of these diseases. This paper presents BREATHE GUARD, an integrated multi-sensor device developed for real-time monitoring of respiratory health and surrounding environmental conditions. The proposed system integrates multiple sensors to measure critical physiological parameters including respiratory rate, lung pressure, oxygen level, and respiratory sounds, which provide important insights into respiratory function and breathing abnormalities. The device is implemented using a microcontroller-based embedded system that acquires and processes sensor data through embedded programming techniques. The collected data are transmitted to an Internet of Things (IoT) cloud platform, enabling secure storage, real-time analysis, and remote monitoring. Users and healthcare professionals can access the monitored information through a connected interface for continuous observation and assessment. In addition, predefined threshold values are used to detect abnormal respiratory conditions and generate alert notifications for early intervention. The proposed system is portable, cost-effective, and suitable for both home-based and clinical respiratory monitoring applications. Experimental evaluation indicates that the system can effectively monitor respiratory parameters and provide timely alerts, supporting early detection and improved management of respiratory disorders.

Keywords: Respiratory health monitoring, multi-sensor system, IoT healthcare, respiratory disease detection, real-time monitoring.

PAPER ID: A088

EVALUATING WOMEN'S STANDARD OF LIVING THROUGH MICROFINANCE AND INNOVATIONS IN SUSTAINABLE MICROFINANCE IN TIRUNELVELI.

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Abstract

Self-Help Groups (SHGs) have emerged as effective institutions for empowering rural women by improving their access to credit, enabling entrepreneurship, and promoting social participation. In Tirunelveli District, SHGs have significantly enhanced the socio-economic status of rural women by improving their savings habits, family expenditure patterns, and reducing dependency on informal lending sources. This study finds that SHGs play a vital role in fostering financial inclusion, alleviating poverty, and enhancing women's participation in developmental processes. If properly supported, SHGs can continue to uplift economically disadvantaged women and drive sustainable rural development.

Keywords: Self-Help Groups, socio-economic, Income opportunities, Innovations in Sustainable

Paper Id: A089

OPTIMIZATION OF SANDWICH PLATE WITH HONEYCOMB STRUCTURE FOR IMPACT LOAD

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Abstract

This project presents a finite element–assisted optimization methodology to enhance both the transverse impact and static performance of sandwich plates with a re-entrant auxetic core. The objective is to identify optimal geometric configurations that minimize transverse deflection while maintaining a constant structural mass. Effective elastic properties of the re-entrant unit cell are determined using a representative volume element approach and incorporated into a homogenized plate model. The macroscopic response of the sandwich plate under low-velocity transverse impact and static loading is analyzed using a sub-parametric finite element formulation based on first-order shear deformation theory. A genetic algorithm is coupled with the finite element solver to optimize key geometric parameters of the re-entrant core. Results show that optimized auxetic configurations significantly reduce maximum deflection compared to randomly selected designs without compromising auxetic behavior. The optimal designs are also found to be insensitive to variations in plate dimensions for a given relative density and to exhibit improved stiffness and energy absorption. Numerical results are validated experimentally, showing excellent agreement and demonstrating the effectiveness of the proposed methodology.

Keywords: Auxetic materials, Re-entrant core, Sandwich plates, Finite element analysis, Genetic algorithm optimization, Low-velocity impact, Homogenization method.

Paper Id: A090

Structural Transformation and Microstructural Characteristics of Ga-Doped BiFeO₃ Nanoparticles

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Abstract

Bismuth ferrite nanoparticles with the composition Bi_{1-x}Ga_xFeO₃ ($0 \leq x \leq 1.0$) were synthesized via a citrate auto-combustion method to investigate the influence of gallium substitution on their structural and microstructural properties. X-ray diffraction analysis combined with Rietveld refinement reveals a progressive structural transformation from a rhombohedral (R3c) to an orthorhombic (Pna2₁) phase with increasing Ga content. This incorporation of gallium leads to a systematic reduction in lattice parameters, unit cell volume, and average crystallite size ranges from approximately 45 nm to about 18 nm, indicates a contraction of the crystal lattice. The results also point to improved phase stability and enhanced structural homogeneity across the entire composition range. Microstructural observations show the formation of nanoscale particles with a relatively uniform morphology, along with suppressed grain growth at higher doping levels. These findings highlight that gallium substitution significantly alters both the crystal structure and microstructure of BiFeO₃, offering a viable route for tailoring the properties of multiferroic oxide nanomaterials.

Keywords: BiFeO₃-GaFeO₃ system; Citrate combustion method; X-ray diffraction (XRD); Rietveld refinement; Scanning electron microscopy (SEM)

Paper Id: A091

AI INTEGRATED OPERATING SYSTEM

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Abstract

The rapid advancement of artificial intelligence has opened new possibilities for improving human-computer interaction. However, traditional operating systems continue to rely on graphical user interfaces and command-line interfaces, which require technical expertise and manual effort from users. This limitation creates challenges for nontechnical users when performing basic system-level operations such as file and folder management. This paper presents the design and implementation of an AI-integrated Linux operating system interface that enables users to interact with the system using natural language through textbased commands, with scope for voice-based interaction. The proposed system is developed on an open-source Linux platform and utilizes a Large Language Model (LLM) through the Gemini API to interpret user intent. Natural language inputs are processed by the AI engine, converted into valid Linux system commands, and executed safely within the operating system environment. To ensure reliability, the system incorporates a validation and command-filtering mechanism that prevents the execution of unsafe or unauthorized operations. The architecture follows a modular design, allowing seamless integration with existing Linux distributions without altering the core system components. Performance evaluation is conducted based on intent recognition accuracy, execution success rate, and response time. Experimental results indicate improved accessibility for users with limited technical knowledge while maintaining system efficiency. The solution also demonstrates scalability, enabling future expansion to support advanced system operations beyond file management. Furthermore, the framework lays the foundation for incorporating adaptive learning mechanisms to enhance contextual understanding over time. By bridging the gap between users and complex system commands, the proposed interface contributes toward the development of intelligent and user-centric operating systems. The primary focus of the system is accurate and efficient file management, including operations such as creating, deleting, and organizing files and directories. By simplifying complex system interactions into intuitive natural language commands, the proposed solution enhances usability, accessibility, and productivity. The implementation results demonstrate that the system can effectively interpret user intent and perform file management tasks with high accuracy, highlighting the potential of AI-assisted operating system interfaces for future intelligent computing environments.

Keywords: Artificial Intelligence, Linux Operating System, Natural Language Processing, Large Language Models, File Management, Human-Computer Interaction.

Paper Id: A092

Hospital Resource Availability And Analytics System

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Abstract

MediTrack is a web-based healthcare resource management system designed to improve real-time tracking and coordination of hospital resources. The system integrates six major modules: bed availability tracking, blood bank inventory management, pharmacy stock monitoring, medical equipment tracking, ambulance dispatch coordination, and doctor schedule management. A role-based access system enables hospital staff to perform create, read, update, and delete operations, while patients are provided with read-only access to view resource availability across departments. Each module is supported by simple and efficient algorithms to ensure accurate and timely updates. Bed and blood modules use threshold-based logic to generate alerts when resources fall below critical levels. The equipment module uses a status tracking system along with a maintenance prediction algorithm to monitor equipment condition and ensure timely servicing. The doctor module uses availability matching to update schedules in real time, while the pharmacy module performs expiry and quantity analysis to detect shortages. An alert system based on Naïve Bayes classification identifies critical conditions and triggers notifications. The AI health module uses a rule-based algorithm to provide preliminary health suggestions, and the chatbot module uses pattern-matching techniques to respond to user queries. The frontend is developed using HTML, CSS, and JavaScript, while the backend uses Python Flask with an SQLite database. Testing results show improved efficiency, faster access to information, and better decision-making compared to traditional methods. MediTrack enhances coordination, reduces delays, and improves overall healthcare service delivery.

Keywords: Ambulance Dispatch, Bed Availability, Blood Bank, Healthcare Resource Management, Real-Time Monitoring.

Paper Id: A093

Bio-fluid Based Mitigation of Salt Clogging in Drip Irrigation Emitters

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Abstract

The clogging of salt in drip irrigation emitters is a major issue in areas where saline and hard water is available for use. The deposition of calcium and other salt minerals in the emitters reduces the flow of water and makes it uneven. The project aims at developing a bio-fluid based mitigation technique for controlling and removing clogging of salt in drip irrigation emitters. The bio-fluid is cow urine which is used because it contains organic acid and bio-active compounds that help in dissolving and reducing the hardness of the salt minerals deposited in the emitters. The bio-fluid is injected into the drip irrigation system at regular intervals and reacts with the deposited salt minerals, reducing their hardness and adhesiveness on the inner surface of the emitters. After some time, water is flushed through the emitters to remove the loosened salt particles. The performance of the system is tested by using emitter discharge, clogging ratio and discharge recovery percentage as parameters. The results show that the cow urine based bio-fluid is an eco-friendly and effective cleaning technique for controlling and removing clogging of salt in drip irrigation emitters.

Keywords: Drip irrigation emitters, Salt clogging, Saline and hard water, Eco- friendly cleaning technique.

Paper Id: A094

Biomass Energy Utilization for Enhancing the Efficiency of Cold Storage System in Banana Processing Unit

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Abstract

Banana processing industries generate a large amount of organic waste such as banana peels, stems and other residues during different stages of processing. If these wastes are not properly managed, they can create disposal problems and lead to environmental pollution. Instead of allowing these materials to remain as waste, they can be collected and converted into useful biomass energy for industrial applications. At the same time, cold storage system used for preserving bananas requires significant amount of energy to maintain a sustainable temperature and storage condition increasing the overall energy demand of banana processing units. Biomass energy is considered a renewable and sustainable energy source because it can be produced from organic waste materials that are easily available in such industries. This project focuses on studying the utilization of biomass energy for improving the efficiency of cold storage system in banana processing units. The study was conducted at Tamil Nadu banana producer company limited located in Thottiyam. Currently, the company utilizes solid wood waste as biomass fuel for generating energy required for its operations. In this project, additional biomass source such as dried banana peels and powdered organic residues are proposed to enhance efficiency of the biomass system.

Keywords: Banana Processing Waste Collection, Biomass Fuel Preparation, Biomass Energy Generation, Cold Storage Energy Supply, Sustainable Waste Utilization.

Paper Id: A095

IMPLEMENTATION AND STUDY OF A FUZZY LOGIC-BASED BOOST CONVERTER FOR SOLAR EV CHARGING

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Abstract

The combination of solar energy and electric vehicle (EV) charging station is the key in drastically reducing our dependence on fossil fuels. Electricity comes from a variety of sources and it's crucial that electric vehicles will be powered by renewables. Electric cars are becoming immensely popular and in the coming years we expect nearly everyone who owns a solar energy system will install a solar charging station at its home. For this to happen we'll need a fundamental change in how we think about refueling our cars and the natural evolution of our energy infrastructure. Fluctuations in solar irradiance and temperature cause variations in the PV output voltage, which can adversely affect battery charging performance and overall system efficiency. To address these challenges, this study presents the implementation and analysis of a fuzzy logic-based DC–DC boost converter designed specifically for solar EV charging applications. A comprehensive fuzzy rule base is designed to ensure rapid dynamic response, minimal overshoot, reduced steady-state error, and low output voltage ripples. The system is modelled and simulated under varying irradiance and load conditions to evaluate performance metrics such as rise time, settling time, voltage regulation, and conversion efficiency. Simulation results demonstrate that the fuzzy logic-based boost converter provides superior robustness, faster transient response, and improved voltage stability compared to traditional control methods.

Keywords: Solar energy, Electric vehicles (EVs), EV charging station, Renewable energy integration, Solar-powered EV charging system, Photovoltaic (PV) system

Paper Id: A096

Analysis of Structural Design and Utilization of Insulation material in Solar Dryer for Heat Loss Reduction

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Abstract

Solar drying is widely recognized as a sustainable technique for preserving agricultural produce by reducing moisture content using energy derived from the sun. Compared with conventional drying systems, solar dryers require minimal external energy and produce lower environmental impact. However, the overall effectiveness of these systems is often limited by thermal losses occurring through the dryer structure and insufficient insulation. Excessive heat loss reduces the internal temperature of the drying chamber, thereby lowering the drying rate and affecting product quality. This study investigates the structural configuration and the application of insulation materials in a solar dryer with the objective of reducing heat loss and improving thermal efficiency. The main structural elements of the system, including the supporting frame, drying chamber, tray arrangement and ventilation openings, are examined to determine their influence on heat retention and airflow distribution inside the dryer. These calculations help estimate the amount of energy lost through conduction, convection and other pathways within the dryer structure. The findings of this study highlight the importance of proper structural design and effective insulation in maintaining stable internal temperatures during the drying process. Improved insulation and optimized structural configuration can significantly reduce heat loss, enhance drying efficiency and contribute to better preservation of agricultural products. This analysis aims to identify suitable structural and insulation practices to improve drying efficiency, drying time and support sustainable agricultural processing.

Keywords: Solar Dryer, Heat Loss Reduction, Insulation Materials, Structural Design Analysis, Thermal Efficiency.

Paper Id: A097

FAULT ISOLATION IN MULTI CELL SERIES BATTERY SYSTEM

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ABSTRACT

The proposed system introduces a fault-tolerant multi-cell series battery architecture designed for critical applications such as aerospace, defense, and telecom. A ring topology with dual current paths ensures uninterrupted power delivery by re-routing current during cell failures. Predictive diagnostics, powered by AI models and optimized with Nonlinear Programming, enable early fault detection and reduce false alarms. Solid-state bypass switches and floating DC-link capacitors maintain stable operation during isolation. An embedded controller or FPGA manages real-time fault detection, switching, and cell balancing. Simulation results confirm improved reliability, fault tolerance, and energy efficiency compared to traditional battery management systems.

Paper Id: A098

Optimization of image processing and segmentation techniques for coronary angiography vessel extraction

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Abstract

Coronary artery disease (CAD) is one of the causes of death in the cardiovascular system and is mainly triggered by the constriction or obstruction of the coronary arteries. To visualize these vessels, the use of coronary angiography is rampant, but noise, poor contrast, and imaging artifacts make it very difficult to extract the vessels accurately. To determine fractional flow reserve, stenosis detection, and assessments, we need a vessel extraction that can be dependable. In this paper, a comparative analysis and optimization of various preprocessing and segmentation methods are conducted in extracting coronary vessels. Preprocessing techniques used include: CLAHE, Gaussian filtering, Median filtering, Bilateral filtering, and a morphological process that is used to improve the quality of images. These are combined with segmentation techniques, including Frangi, Sato, Otsu thresholding, matched filtering, and Kirsch edge detection. The PSNR, SSIM, SNR, and vessel contrast are the measures that are used to compare the performance of various combinations of methods. It has been experimentally determined that Gaussian filtering with Frangi vessel enhancement offers the best vessel extraction with PSNR values of about 44 dB, SSIM of about 0.97, and continuity of the vessel is preserved. The pipeline is optimized and offers stable vessel extraction and a basis for further analysis of fractional flow reserve.

Keywords: Coronary Angiography, Vessel Segmentation, Image Preprocessing, Frangi Filter, Medical Image Processing, Fractional Flow Reserve.

Paper Id: A099

Autonomous Market Research and Trend Analysis Crew

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Abstract:

The Autonomous Market Research and Trend Analysis Crew is a multi-agent artificial intelligence system developed to automate market research and trend forecasting activities. , addressing the limitations of conventional approaches that are often time-consuming, costly, and less accurate. Built using the CrewAI framework and integrated with the Model Context Protocol (MCP), the system consists of five specialized AI agents: a Market Researcher, Trend Analyst, Data Collector, Report Generator, and Quality Assurance agent. Each agent is designed to perform a distinct function, enabling efficient collaboration across the research pipeline. The system collects data from multiple sources, including APIs, web-based content, news platforms, and social media, and processes this information into structured, decision-oriented reports suitable for executive use. By leveraging advanced machine learning methods and natural language processing techniques, the framework is capable of analysing dynamic market data in real time. This approach significantly reduces the time and cost associated with conventional market research while enhancing the accuracy and relevance of the generated insights. Designed with scalability in mind and deployed using Docker, the project demonstrates how multi-agent AI systems can be applied to real-world market intelligence challenges. Overall, it provides organizations with timely, reliable, and data-driven support for strategic decision-making.

Keywords: CrewAI, Model Context Protocol, review study, autonomous agents, market research, trend forecasting, competitive intelligence, multi-agent collaboration, AI-driven automation

Paper ID A100

AI and Green AI in Education: Examining Student Engagement, Infrastructure, Utilization, and Sustainable Leadership in Secondary-level schools of Raebareli, Uttar Pradesh

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ABSTRACT

This dissertation investigates the role of leadership in integrating Artificial Intelligence (AI) and Green AI technologies within the education sector of Uttar Pradesh to foster climate resilience and sustainability. Using a mixed-methods approach with survey data (n = 120) and qualitative insights from faculty, students, administrators, and community voices, the study explores the intersections of technology, leadership, and sustainability. Findings reveal that AI adoption improves student engagement and adaptability, but infrastructural limitations (internet, electricity, affordability) hinder widespread integration in rural areas. Awareness of Green AI—focused on eco-friendly, energy-efficient practices—remains minimal across institutions. Leadership emerged as the most decisive factor: visionary leadership in urban universities encouraged sustainable adoption, while rural leaders faced capacity gaps. The study concludes that sustainable AI integration requires visionary leadership, infrastructural equity, and policy frameworks aligned with NEP 2020 and global sustainability goals. This research contributes to the theoretical understanding of leadership in digital transitions and provides practical recommendations for policymakers and educators to align AI adoption with climate-conscious strategies. The research further focuses on the varied level of digital preparedness and sustainable technology across secondary level educational schools. The analysis indicates variations in institutional planning, infrastructural adequacy and access to professional development opportunities, notably increase efficacy of AI-enabled teaching and learning practices. The research emphasizes only the presence of digital resources are not sufficient but to ensure meaningful AI integration, it should be followed by organizational alignment, strategic leadership and continuous skill enhancement among educators. Furthermore, outcome reveals that due to meagre familiarism of Green AI principles limits the capability of artificial intelligence to support environmental sustainability and climate adaptability within the education system. School teachers and leaders pointed to the requirement for situational capacity-building programs and supportive policy framework to stabilise technological advancement with ecological responsibility. By combining leadership theories with sustainability-focused and digital transformation frameworks, this research provides practical insights for positioning AI implementation with long-term educational development and climate-resilient goals in resource-limited educational frameworks such as Uttar Pradesh.

KEYWORDS: Artificial Intelligence (AI), Green AI, Sustainable AI, Educational Leadership, Digital Infrastructure, AI Adoption, Academic Engagement, Teacher Readiness, Student Adaptability, Climate Resilience, Sustainability in Education, Secondary Education, Government Schools, Private Schools, Digital Divide, Energy-Efficient Technologies, Policy Implementation, Institutional Capacity, Technology Acceptance, NEP 2020, Environmental Sustainability, Educational Innovation, Smart Classrooms, Ethical AI, Rural–Urban Disparity, AI Awareness, Educational Transformation

PAPER ID : A101

Future Trends in HR Recruitment Technologies: A Study of TENNECO Automotive India Pvt. Ltd., Puducherry.

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ABSTRACT

Human Resource Management has undergone significant transformation with the advancement of technology, especially in the recruitment and selection process. The present study titled “A Study on Future Trends in HR Technology for Recruitment in Tenneco Automotive India Pvt. Ltd., Puducherry” aims to analyse how modern technologies influence recruitment practices and how HR professionals adapt to these technological developments. Recruitment plays a vital role in organizational success by attracting and selecting the right talent. With the emergence of digital tools such as artificial intelligence, applicant tracking systems, virtual interviews, and social media recruitment, organizations are able to streamline hiring processes, improve efficiency, and make better data-driven decisions. The main objectives of this study are to examine the awareness of HR professionals regarding new hiring technologies, understand their perspectives toward adopting these technologies, and identify the challenges faced while implementing them. The research adopted a descriptive research design, and data were collected from 50 respondents working in the organization through structured questionnaires. Both primary and secondary data were used for the study. The collected data were analysed using statistical tools such as Correlation Coefficient and chi-square test to interpret the responses effectively. The findings of the study reveal that a majority of the respondents are aware of emerging technologies such as Artificial Intelligence and machine learning in recruitment processes. Many respondents agree that technological tools improve the effectiveness and speed of hiring, making the recruitment process more efficient and structured. Technologies such as video conferencing interviews, digital job postings, and online personality assessments help organizations reach a wider pool of candidates and simplify candidate evaluation. However, the study also identifies several challenges including lack of training opportunities, resistance to change among employees, financial constraints, and concerns related to data security and bias in automated systems. Overall, the study concludes that HR technology plays a crucial role in shaping the future of recruitment. Organizations that effectively integrate advanced recruitment technologies can improve hiring quality, reduce recruitment time, and enhance the candidate experience. At the same time, companies must focus on training HR professionals, ensuring ethical use of technology, and maintaining a balance between automation and human judgement in the recruitment process.

Keywords: Artificial Intelligence, Automation, Data Analytics, HR Technologies, Machine Learning.

Paper Id: A102

Design and Implementation of a Variable Step Size MPPT Algorithm for Efficient Solar Powered EV Charging

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ABSTRACT

The increasing adoption of electric vehicles has created a growing demand for efficient and reliable charging infrastructure. Integrating renewable energy sources, particularly solar photovoltaic systems, with EV charging stations offers a sustainable solution to reduce dependence on conventional energy resources. However, the power generated by solar panels varies with changes in solar irradiance and temperature, which affects the efficiency of the charging system. To overcome this limitation, Maximum Power Point Tracking (MPPT) techniques are commonly used to extract the maximum available power from photovoltaic panels. This project presents the implementation of a Variable Step Size MPPT algorithm to improve the efficiency of solar-powered EV charging stations. Unlike conventional MPPT methods that use a fixed step size and may lead to slow tracking or power oscillations around the maximum power point, the proposed approach adjusts the step size dynamically based on changes in operating conditions. This enables faster convergence to the maximum power point and reduces steady-state oscillations, thereby improving the overall system performance. The proposed system integrates a photovoltaic array, a DC–DC converter, and an EV charging unit controlled by the variable step size MPPT algorithm. The performance of the system is evaluated under varying environmental conditions to analyze its ability to maintain efficient power extraction. Results demonstrate that the adaptive step size approach enhances tracking speed, improves energy utilization, and ensures stable operation of the charging station. The implementation of this technique can contribute to the development of efficient and sustainable EV charging infrastructure powered by renewable energy sources.

Keywords: Variable Step Size MPPT, Electric Vehicle Charging Station, Solar Photovoltaic System, Maximum Power Point Tracking, DC–DC Converter, Renewable Energy Integration, Power Optimization, Energy Efficiency.

Paper Id: A103

Design and comparison study of different types of Pressure vessel heads using ASME BPVC codes

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Abstract

This research presents a rigorous techno-economic analysis and comparative evaluation of the structural mechanics, manufacturing complexity, and production costs of primary pressure vessel heads, specifically focusing on hemispherical, 2:1 ellipsoidal, torispherical, and conical geometries. Established within the framework of the ASME Boiler and Pressure Vessel Code (BPVC) Section VIII, Division 1, the study utilizes the Design- by-Rule (DBR) philosophy to determine minimum required thicknesses (t) via Part UG (UG-27, UG-32, and UG-33) for SA-516 Grade 70 carbon steel components. The analytical methodology was validated using PV Elite static equipment design software to cross-examine Von Mises stress distributions against Maximum Allowable Working Pressure (MAWP) limits, while factoring in joint efficiency and corrosion allowances. The investigation reveals that while hemispherical heads offer the highest structural integrity and lowest material consumption due to a purely membrane stress state, their industrial application is frequently constrained by extreme fabrication difficulty and high multi-petal welding costs. Conversely, 2:1 ellipsoidal heads emerge as the optimal industrial compromise for high-pressure service, balancing superior volumetric efficiency with moderate manufacturing complexity and thickness requirements. Torispherical heads, despite localized discontinuity stresses in the knuckle region that necessitate increased thickness to prevent buckling, provide the most cost-effective solution for low-to-medium pressure applications due to standard availability and manufacturing simplicity. Conical heads are analyzed as essential geometric transitions, requiring specialized reinforcement at the large-end junction to mitigate combined membrane and bending stresses as per Mandatory Appendix 1-5. By synthesizing analytical code calculations with computational analysis and manufacturing variables, this study provides a structured decision-making matrix based on a weighted assessment of strength-to-weight ratios, ease of production, and total capital expenditure. The results suggest that while hemispherical heads offer maximum strength, the 2:1 ellipsoidal head is the "best" overall choice for standard industrial high-pressure applications. Ultimately, the research concludes that geometry selection must align with specific operational pressures and localized manufacturing capabilities to ensure optimal safety and economic performance in static equipment design.

Keywords: Pressure vessels; ASME codes; Standards; Maximum stresses; pv elite software

Paper Id: A104

DESIGN AND PERFORMANCE ANALYSIS OF A COMPACT MIMO ANTENNA FOR WIRELESS COMMUNICATION SYSTEMS

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Abstract

The extreme development of the modern wireless communication technology, such as 5G, Internet of Things (IoT), and new systems under 6G has put a strain on the compactness and efficiency of the antenna design that is able to sustain high data rates and connectivity. Multi-input Multi-output (MIMO) antenna designs are one of the rudimentary technological advances that aim at increasing the channel capacity, spectral efficiency and communication reliability of state-of-the-art wireless devices. In this paper, design and performance analysis is given to a small MIMO antenna to wireless communication systems. The suggested antenna design is developed with a small geometry and optimized layout to get large impedance bandwidth and low mutual coupling among the antenna elements. Moreover, they also use appropriate decoupling methods and ground structure adjustments to improve isolation and the performance of the antenna as a whole. All the critical performance parameters that are used to analyse the proposed MIMO antenna include reflection coefficient (S₁₁), impedance bandwidth, radiation characteristics, gain, isolation, envelope correlation coefficient (ECC) and diversity gain. Simulation output proves that the antenna has an impedance bandwidth in the desired wireless frequency bands that have a reflection coefficient of lower than -10 dB, and with isolation of more than 20 dB between antenna elements. More so, the antenna has a value of ECC of less than 0.05 with a diversity gain of near 10 dB meaning that it has high MIMO diversity performance. Obtained results prove the suitability of the proposed compact MIMO antenna to the modern wireless devices, portable communication systems and the next generation high speed wireless networks.

Keywords - MIMO antenna, wireless communication, compact antenna design, mutual coupling reduction, isolation enhancement

Paper Id: A105

AI BASED TRANSFORMER HEALTH MONITORING SYSTEM

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Abstract

Power transformer is an essential component of the power transmission and distribution network. Any structural defects, i.e., cracks on the transformer's body, may lead to insulation deterioration, leakage of the transformer's oil, etc., which may result in the transformer's failure if not rectified at an early stage. The conventional method of transformer inspection involves manual inspection. AI&ML, in addition, has provided an opportunity to implement smart monitoring systems. In this paper, an AI-based smart transformer health-monitoring system is implemented using embedded computer vision for crack detection. In this system, an ESP32-CAM module is used for acquiring images of the transformer's surface during the monitoring process. These acquired images are used to create a dataset, which is then categorised into two types: Crack and No Crack. Using the Edge Impulse tool, an ML-based model is created and optimised for implementation on an embedded platform. The proposed model is implemented directly on the ESP32-CAM module for crack detection purposes. Once a crack is detected, an alert message is sent, which can be achieved locally or remotely through different IoT communication protocols. This will enable an automated monitoring process for defects on the transformer's surface in an affordable, automated, and real-time manner. The proposed AI-based monitoring system has the potential for reducing costs related to maintenance, failure, and improving safety for the power distribution network.

Keywords: Smart Helmet, Computer Vision, RFID Authentication, Road Hazard Detection, MEMS Sensor, Arduino, Intelligent Transportation System

Paper Id: A106

PERFORMANCE EVALUATION OF ROTAVATOR FOR BANANA PSEUDOSTEM AND RESIDUES MANAGEMENT

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ABSTRACT

Banana cultivation produces a large quantity of biomass in the form of pseudostems and crop residues after harvesting. Improper disposal of these residues often leads to difficulties in field management and may cause environmental issues when residues are burned. Efficient in-situ management of banana residues is important for improving soil fertility and reducing labour requirements. The present work evaluates the performance of a rotavator for effective shredding and incorporation of banana pseudostem and crop residues under field conditions. The study focuses on assessing operational parameters such as field capacity, field efficiency, fuel consumption and working efficiency during rotavator operation. The rotavator was operated in a harvested banana field and observations were recorded for working width, operating speed, time of operation and fuel usage. The performance indicators were calculated using standard farm machinery performance equations. The results indicate that the rotavator effectively cuts and mixes banana pseudostem residues with soil, reducing the need for manual residue removal. The operation also improves soil organic matter by incorporating biomass directly into the soil. The evaluation demonstrates that the use of a rotavator can significantly enhance residue management efficiency while saving time and labour. Therefore, the use of rotavators for banana pseudostem and residue management can be considered a practical and sustainable approach for improving field preparation and promoting better soil health in banana cultivation systems.

KEYWORDS: Cultivation, Biomass, Pseudostems, Environmental, Incorporation, Operational, Consumption.

Paper Id: A107

AI-Enabled Real-Time Alert System for Detecting Wild Animal Intrusions at Forest and Village Borders

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Abstract

This paper presents an AI-enabled system to detect and notify users of wild animal intrusions in agricultural fields and village areas adjacent to forests, aiming to mitigate human–wildlife conflicts. The proposed solution enhances existing YOLO-based and edge computing frameworks by incorporating GPS-based location tracking and dual alert mechanisms. The system employs ESP32-CAM modules and ultrasonic sensors to capture motion-triggered images along established animal pathways. These images are processed locally using a YOLO object detection model to identify animals such as elephants, leopards, and wild boars with minimal latency. Upon detection of an animal, AI generated alerts specifying the animal type and location are dispatched via offline SMS over GSM/4G networks and through an online interface that delivers real-time visual and auditory alerts for civilians and forest rangers. Detection data is stored in the cloud for movement analysis and model enhancement. The system is cost-effective, scalable, and well-suited for deployment in rural areas.

Keywords: Wild Animal Intrusion, Human-Wildlife Conflict, YOLO, Edge AI, TinyML, IoT Sensors, GPS Localization, SMS Alerts.

Paper Id: A108

SMART – Secure Mobile Access with Remote IoT Technology

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ABSTRACT

In today's digital world, ensuring reliable security for homes, offices, and industries has become increasingly important due to the rising risk of theft and unauthorized access. Traditional door locking systems that rely only on physical keys have several limitations such as key loss, duplication, and the lack of real-time monitoring. These challenges highlight the need for a smarter and more secure access control system. To address this issue, this project presents SMART – Secure Mobile Access with Remote IoT Technology, an advanced door security system designed to improve safety, reliability, and user convenience. The proposed system integrates three levels of authentication: fingerprint verification, password authentication, and One-Time Password (OTP). These security layers ensure that only authorized users can gain access to the door. An ESP32 microcontroller functions as the central controller of the system, handling biometric authentication, password validation, and OTP communication through IoT connectivity and a mobile application. The fingerprint sensor verifies the user's unique biometric identity, while the password provides an additional authentication layer. The OTP adds a dynamic security factor by generating a time-sensitive code that is securely sent to the user's smartphone. Access is granted only when all three authentication stages are successfully completed. Once verification is successful, the ESP32 activates a 12V solenoid lock to unlock the door. The IoT functionality enables remote monitoring and secure access control for users.

KEYWORDS: IoT Security System, Smart Door Lock, Biometric Authentication, Fingerprint Recognition, Mobile Based Security, Solenoid Door Lock.

Paper Id: A109

Multi-Platform Social Media Engagement Analysis: An Empirical Study of User Interaction Patterns Using Social Network Data Analytics

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Abstract

Social media platforms receive a lot of information regarding how users interact with each other through various parameters such as views, likes, comments, and sharing. By studying information, it is possible to understand how users interact with each other. This study aims to use Social Network Data Analytics (SNDA) to analyze the interaction of users on different social media sites. Descriptive analysis, comparative analysis, correlation analysis, and data visualization techniques were used to analyze the secondary data, which already had the engagement metrics. This study aims to identify topics, and the correlation of the engagement metrics. The result of the study revealed that the level of engagement varies for different platforms, but the likes factor is the most important factor for the engagement level. It has been revealed that the engagement metrics can accurately reflect the interaction of users with each other.

Keywords: Social Network Data Analytics, Social Media Engagement, User interaction, Multi-Platform Analysis.

Paper Id: A110

Predicting University Student Dropout Using Synthetic Data and Machine Learning Algorithms

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Abstract

Student attrition is one of the biggest problems facing universities, and affects students themselves as well as their families and even the education system at large. Previous research has looked primarily on performance related factors including grades and exam results to elucidate the dropout phenomenon. Yet these in themselves do not adequately explain the complexity which constitutes student dropout as influenced by a range of inter-related factors. This research makes a departure by considering academic imagery, attendance image, financial image and class or campus engagement in student to dropout and completes the picture. For example, one student of average academic performance who both attends and actively engages with class may stay in school while another student of similar performance, but has a lost job as well as poor attendance is at risk of dropping out. For privacy purposes related to student data, simulated datasets anonymized from real individual profiles which did not reveal any personal or identification information were used in the analyses. Machine learning methods such as the decision trees and random forest were used to find most important predictors of a dropout. A Power BI dashboard was also created to share findings in a user-friendly way for school administrators. The study's overarching goal is to identify and prevent dropouts by identifying root causes of attrition that will enable targeted interventions such as peer mentoring, counselling, or financial support that can increase student retention and success.

Keywords: Student Dropout Prediction, Higher Education, Machine Learning, Data Analytics, Random Forest, Ensemble Learning, XGBoost.

Paper Id: A111

AUTOMATED CARDIOVASCULAR DISEASE DETECTION USING ML & DL TECHNIQUES ON ECG SIGNALS

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Abstract

Detecting traffic signs is important for many purposes, like ensuring safe driving and identifying illegal driving behavior. This study assesses specialized tools (e.g., Resnet, Inception, Mobile-net, and Dark net) and sophisticated detection models. It improves the trained prior model using the Microsoft Coco dataset for German car sign detection by using adaptive learning. evaluation of image size, computational complexity, speed, memory utilization, and accuracy. The results show that R-Fcn Resnet 101 balances precision and quick performance While Ssd Mobile-net is the fastest and best memory, Yolo Version 2 excels in performance & precision making it perfect for embedded devices, mobile devices, and gadgets.

keywords—Recognition of traffic signs, detection models, adaptive learning, pre-trained model, detection models, Resnet, Inception, Mobilenet, Darknet, memory use, computational complexity, SSD Mobilenet, embedded devices, and accuracy (mAP).

Paper ID -A112

Strength Development of Ultrafine Slag Blended PPC Concrete

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Abstract

This study investigates the early-age performance of PPC concrete incorporating 8% ultrafine slag, with emphasis on 14-day compressive strength and hydration chemistry. Concrete cubes of size 150 mm × 150 mm × 150 mm were cast with a water–cement ratio of 0.45 and cured under standard water curing conditions. At 14 days, the concrete achieved approximately 75–85% of its 28-day target mean strength (38.25 MPa), indicating significant early strength development. The strength enhancement is attributed to both primary cement hydration and secondary reactions of ultrafine slag. During hydration, tricalcium and dicalcium silicates form calcium silicate hydrate (C–S–H) and calcium hydroxide. The ultrafine slag reacts with calcium hydroxide through pozzolanic and latent hydraulic reactions, producing additional C–S–H gel and calcium aluminate hydrates. This secondary gel formation refines pore structure, reduces calcium hydroxide content, and densifies the microstructure. The findings demonstrate that ultrafine slag blended PPC concrete provides improved early strength and enhanced durability potential, making it suitable for sustainable structural applications.

Keywords: PPC Concrete, Ultrafine Slag, Compressive Strength, Early-Age Strength, Hydration Chemistry, Pozzolanic Reaction, Calcium Silicate Hydrate (C–S–H), Sustainable Concrete.

Paper Id: A113

Impact of ESG Controversies on Stock Price Performance

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Abstract

This research examines how Environmental, Social, and Governance (ESG) controversies influence stock price performance. The study analyzes 100 global companies from industries such as banking, energy, technology, pharmaceuticals, consumer goods, and infrastructure to determine whether ESG-related issues lead to short-term or long-term changes in stock prices and how investors react to these events. The research categorizes controversies into three types: environmental, social, and governance. Environmental issues include pollution, climate-related lawsuits, and industrial accidents. Social issues involve labour disputes, consumer safety concerns, and workplace misconduct. Governance issues include fraud, accounting manipulation, bribery, and regulatory violations. The study examines stock price reactions following these controversies, identifying patterns of decline, recovery, or long-term financial impact. The findings show that governance-related controversies, particularly those involving fraud or financial misreporting, tend to cause the largest and most lasting declines in stock prices. In contrast, environmental and social controversies usually create short-term volatility unless they involve major legal penalties, serious accidents, or significant loss of investor trust. The research also finds that large and financially strong companies often recover more quickly from ESG-related events. Overall, investors react more strongly to controversies that threaten a company's financial stability and credibility. ESG issues that create serious legal or governance risks are more likely to have long-term market effects, while reputational issues alone often lead to temporary market reactions. The study provides insights into how capital markets evaluate ESG risk and its impact on shareholder value.

Keywords: Descriptive analysis, Stock price, Environmental, Social, Governance.

Paper Id: A114

AI-Based Cutting Tool Selection and Turning Parameter Optimization Using Fuzzy Logic and Genetic Algorithm

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Abstract

Selection of cutting tools and machining parameters strongly affects productivity in CNC turning operations, while industrial practice often relies on handbook recommendations or operator experience. This study presents an intelligent decision-support framework for cutting tool selection and turning parameter optimization. A fuzzy logic model based on an ANFIS concept is used to select suitable cutting tools by considering workpiece material, hardness, and surface finish, and a Genetic Algorithm is employed to optimize cutting speed, feed rate, and depth of cut with the objective of maximizing material removal rate within realistic machining limits. The proposed approach is implemented in Python and demonstrated using a benchmark CNC turning case study involving mild steel, aluminium, and stainless steel. Validation is performed by comparing the AI-optimized parameters with conventional handbook-based machining practices. The results show productivity improvements of approximately 66.7%, confirming the industrial applicability of the proposed framework.

Keywords: CNC Turning, Cutting Tool Selection, Fuzzy Logic, Genetic Algorithm, Machining Parameter Optimization and Simulation-Based Optimization.

Paper Id: A115

AI POWERED VOICE ANALYSIS FOR MEDICAL DIAGNOSIS

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Abstract

Early and accurate detection of diseases is essential for effective treatment; however, many neurological, psychological, and respiratory disorders remain undetected in their early stages due to subtle symptoms and costly diagnostic methods. With advancements in Artificial Intelligence (AI) and speech processing, human voice has emerged as a non-invasive biomarker for disease detection. This paper presents an intelligent system titled “AI Powered Voice Analysis for Medical Diagnosis,” which analyzes speech signals to identify underlying health conditions. Voice samples are captured using microphones or mobile devices and processed using techniques such as noise reduction, silence removal, and normalization. Key acoustic features, including Mel-Frequency Cepstral Coefficients (MFCC), pitch, jitter, shimmer, and spectral energy, are extracted and analyzed using machine learning and deep learning models for accurate disease prediction. The system is trained and evaluated using diverse voice datasets to improve robustness and generalization across different speaking styles and conditions. Performance metrics such as accuracy, precision, recall, and F1-score are used to assess the effectiveness of the model. The proposed system provides a cost-effective, scalable, and user-friendly solution for early diagnosis, remote healthcare monitoring, and clinical decision support. It also highlights the potential of AI-driven voice analysis in transforming modern healthcare systems.

Keywords: Artificial Intelligence, Machine Learning, Voice Analysis, Medical Diagnosis, MFCC, Deep Learning, Predictive Analytics.

Paper Id: A116

Overcoming Data Exposure and Rigid Detection Models in Clouds

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Abstract

The presence of malware attacks is a serious threat to cloud-based infrastructures which requires intelligent and scalable methods of detection. This paper proposes a Malware Detection System on MATLAB which is a combination of machine learning and cloud-enabled computing that can determine malicious network activity successfully. The system takes the NSL-KDD dataset and transforms features of network traffic and characterizes patterns of communications as a graph to identify abnormal behavior related to malware propagation. Cross-validation is used to train and validate classification algorithms such as Decision Trees, Support Vector Machines and Ensemble Learning. The framework suggested improves the accuracy of the detection and reduces false positives due to the optimization of the adaptive model. Experiments indicate a robust generalization and high classification when the experiment is conducted in a distributed environment. Cloud integration provides the possibilities to make analysis in real-time, scale up the process and update models. The findings affirm that the suggested system is an effective solution to the early detection of malware in big clouds with high accuracy, reliability, and efficiency

Keywords: Malware Detection, Cloud computing security, NSL-KDD, Network intrusion detection, Ensemble learning, matlab, network computer intrusion detection, matlab implementation.

PAPER ID A117

Biodisruption Efficacy of *vigna unguiculata* L.wap in industrial contaminated soil Amended with PGPR

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Abstract

Industrialization has resulted in the release of large amounts of waste materials that accumulate in surrounding soils and negatively affect soil quality, plant growth, and environmental sustainability. Industrial waste soils often contain elevated concentrations of heavy metals, altered pH, high salinity, and reduced nutrient availability, which collectively create unfavorable conditions for crop production. The present study investigates the growth performance and environmental response of cowpea (*Vigna unguiculata* L. Walp.) when cultivated in industrial contaminated soil. Cowpea is an important leguminous crop widely grown in tropical and subtropical regions due to its high nutritional value, drought tolerance, and ability to fix atmospheric nitrogen through symbiosis with *Rhizobium* bacteria. The experiment was conducted using a pot culture method with different proportions of garden soil and industrial waste soil to evaluate the impact of contamination on plant growth and development. Several growth parameters were recorded, including seed germination percentage, plant height, root length, leaf area, biomass accumulation, and yield characteristics. Soil physicochemical properties such as pH, electrical conductivity, organic matter content, and nutrient availability were also analyzed. In addition, heavy metal concentrations in soil and plant tissues were assessed to understand the extent of metal uptake and accumulation in cowpea plants. Results indicated that cowpea grown in uncontaminated garden soil exhibited higher germination rates, better vegetative growth, and improved biomass production compared to plants grown in waste soil treatments. Increasing levels of industrial waste soil significantly reduced germination percentage, plant height, root development, and overall plant vigor. These negative effects are primarily associated with heavy metal toxicity and unfavorable soil conditions that interfere with nutrient absorption, photosynthesis, and metabolic processes in plants. However, cowpea plants demonstrated a certain level of tolerance to contaminated environments by activating physiological and biochemical defense mechanisms, suggesting their potential role in phytoremediation. This characteristic makes cowpea a promising candidate for the restoration of degraded soils while simultaneously providing agricultural benefits. Proper management strategies, including soil amendments and controlled use of contaminated soils, may enhance crop productivity and reduce environmental risks. Overall, the findings contribute to understanding the interaction between industrial soil contamination and crop growth, and they support the potential use of cowpea in sustainable agriculture and soil rehabilitation programs.

Keywords : Drought tolerance, *Rhizobium*, Heavy metal, Phytoremediation, Contamination, Rehabilitation

Paper Id: A118

DVR in Distributed system For SAGs Reduction With ANN Controller For Power Quality Improvement.

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Abstract

Power quality disturbances especially voltage sags, swells, and short-duration interruptions remain one of the biggest headaches for modern industrial and commercial consumers. Among the available solutions, the Dynamic Voltage Restorer (DVR) has emerged as one of the most effective and frequently deployed devices for protecting sensitive loads. Traditionally, DVRs are used on the load side to inject compensating voltages through an injection transformer, ensuring that downstream equipment receives a stable and regulated supply even when upstream faults occur. This smarter DVR steps beyond simple compensation by actively limiting fault currents in the feeder during disturbances. When a fault occurs upstream, the DVR's virtual inductive behavior restricts the current flow to safer levels while ensuring that sensitive loads in parallel feeders continue to operate without disruption until protective devices isolate the faulted section. A key advantage of the proposed design is that the DVR behaves like a purely effective inductance during fault conditions, ensuring that it does not draw real power from external sources. This protects critical components such as the DC link capacitor and battery from stress and prevents unnecessary energy drain. Although the DVR still consumes energy from the DC link, the controlled and optimized flow extends the device's operational life and reliability. Overall, this AI-enhanced DVR design provides a forward-looking, robust, and energy-efficient approach for improving power quality while delivering superior fault current management in modern distribution systems.

Keywords: energy-efficient , down stream equipment , external sources, ANN, DVR.

Paper Id : A119

Smart Parking Framework For Enhancing Mobility And Reducing Traffic Congestion In Smart Cities

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ABSTRACT

Rapid urbanization and the increasing number of vehicles have created serious parking problems in modern cities. Drivers often spend a significant amount of time searching for available parking spaces, which leads to traffic congestion, fuel wastage, and increased environmental pollution. To address this issue, this study proposes a Smart Parking System designed to improve parking management and enhance urban mobility. The proposed system uses Internet of Things (IoT) sensors installed in parking slots to detect vehicle presence and collect real-time parking data. The collected information is transmitted to a centralized server and displayed through a web or mobile application, allowing drivers to check parking availability before reaching the location. The system also provides navigation assistance to guide drivers to the nearest available parking space.

This solution can significantly reduce traffic congestion, minimize time spent searching for parking, and improve the efficient utilization of parking spaces. Furthermore, it contributes to the development of smart city infrastructure by improving transportation efficiency and reducing carbon emissions.

Keywords: Smart Parking System, Internet of Things (IoT), Smart Cities, Traffic Management, Urban Mobility.

Paper Id: A120

ECO-MED INTELLIGENT PLANT DETECTION AND ANALYSIS SYSTEM

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Abstract

ECO-MED is a machine learning–based system developed for the identification and analysis of medicinal plants using leaf images. The proposed model employs deep learning architectures such as Convolutional Neural Networks (CNN) and EfficientNet to accurately classify plant species based on visual features. An image preprocessing pipeline including resizing, normalization, and augmentation enhances model performance and generalization. The system integrates a Fast API/Flask backend for prediction handling and a MongoDB database for storing medicinal information, including benefits and traditional remedies. Index Terms Medicinal plant identification, Deep learning, Convolutional Neural Network (CNN), Efficient Net, Image classification, Fast API, MongoDB, Ayurveda, Image preprocessing, Pattern recognition

Keywords: Convolutional Neural Networks (CNN), MAPPO, Fast API/Flask, Efficient Net, Image classification, Fast API, MongoDB

Paper Id: A121

Recent Advances in Biochar-Based Materials for Fuel Cells: A Review

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Abstract

Biochar, a carbon-rich material derived from biomass pyrolysis, has emerged as a sustainable, cost-effective alternative to conventional catalysts and electrodes in fuel cells, addressing the pressing need for eco-friendly energy technologies amid global decarbonization efforts. This review synthesizes recent advances (2020–2025) in biochar-based materials for proton exchange membrane fuel cells (PEMFCs), direct methanol fuel cells (DMFCs), and microbial fuel cells (MFCs), emphasizing their role in enhancing performance, durability, and scalability.

Key innovations include heteroatom-doping (e.g., N, S, P) of biochar to boost oxygen reduction reaction (ORR) activity, rivaling Pt-based catalysts, with reported onset potentials exceeding 0.9 V vs. RHE and stability over 10,000 cycles. Hierarchical porous structures, engineered via activation (KOH, H₃PO₄) or templating, improve mass transport and triple-phase boundaries, yielding power densities up to 250 mW/cm² in PEMFCs. Hybrid biochar composites with graphene, metal oxides (e.g., MnO₂, Co₃O₄), or polymers further optimize electron transfer and methanol tolerance in DMFCs, while biochar anodes in MFCs enhance biofilm adhesion and extracellular electron transfer, achieving 2–5 times higher current outputs.

This review critically analyzes synthesis methods, electrochemical performance metrics, and life-cycle assessments, underscoring biochar's potential to reduce fuel cell costs by 40–60% while promoting circular economy principles. Future directions point toward standardized protocols and pilot-scale demonstrations to accelerate commercialization.

Keywords: Bio-char, Fuel Cell, Sustainability, decarbonization

Paper Id: A 122

Biopower and Ritualised Bodies: Institutional Power and Resistance in *Nirmalyam*

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Abstract

This paper analyses the operation of power, ritual, and subjectivity in *Nirmalyam* by M. T. Vasudevan Nair based on the theoretical framework of biopower proposed by Michel Foucault. It examines the mechanism by which the body of the Velichappadu (oracle) becomes a ritualised instrument of the institution of the temple, as a symbolic tool by which authority of the religion controls social order and community faith. Relying on Foucauldian concept of discipline and the production of “docile bodies”, the paper examines how the identity and bodily acting of the oracle are constructed and managed through the institutional mechanisms of temple authority and local social expectations. As the socio-economic and cultural power of the temple begins to decline, the role of the Velichappadu gradually becomes marginalised revealing the fragile and contingent nature of institutional power and its reliance on ritual performance. The paper argues that the tragic climax of the narrative, in which the oracle mutilates his own body, can be interpreted as an extreme act of resistance against the biopolitical regulation of his body and identity. By situating *Nirmalyam* within a Foucauldian discourse on power and subject formation, this study demonstrates how literary narratives reflect broader mechanisms of institutional control and the complex interplay between authority, ritual, and resistance in society.

Keywords: Biopower; Ritualised Body; Institutional Power; Michel Foucault; M. T. Vasudevan Nair; *Nirmalyam*; Resistance.

Paper Id: A123

An Explainable and Resource-Efficient AI Framework for Real-Time Cyber Threat Detection in Edge Networks

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Abstract

Due to the increase in sophisticated cyber attacks, the problem of securing edge networks has become a critical problem, especially because of the decentralized nature of edge networks. Most of the intrusion detection systems that use artificial intelligence have sophisticated deep learning techniques that are computationally infeasible for the devices used to establish the edge network. Furthermore, the inability to explain the results is a disadvantage of the system. In the paper, a practical solution to the problem has been proposed, and this solution is referred to as Explainable and Lightweight AI (ELAI). The proposed solution has been presented in the form of a cyber threat detection system for edge networks. The proposed solution has been evaluated, and the evaluation has been done by using a combination of interpretable machine learning, lightweight deep learning, and privacy-preserving federated learning. The proposed solution has been evaluated by using benchmark data sets that include CICIDS 2017, UNSW-NB15, and N-BaIoT. The proposed solution is capable of achieving state-of-the-art accuracy with a reduced false positive rate and half the inference latency.

Keywords: Explainable Artificial Intelligence (XAI), Edge Computing Security, Lightweight Deep Learning, Cyber Threat Detection, Intrusion Detection Systems (IDS), Federated Learning, Real-Time Network Security, Resource-Constrained Environments, AI-Based Cybersecurity, Trustworthy AI

Paper Id: A124

Schiff base metal complexes of the pyridine moiety as an efficacious anti microbial, anti diabetic and anti oxidant medicine

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Abstract

Coordination compounds play a significant role in medicinal chemistry and the development of pharmaceuticals. Among these, Schiff base metal coordination complexes hold a crucial role in the medical field. Schiff bases are compounds containing an imine group formed by the condensation of a primary amine with a carbonyl group, and they are widely used as ligands in coordination chemistry because they can donate electron pairs to a central atom. Of particular interest are pyridine-based Schiff base ligands, which are notable for their flexible, multidentate bioactive properties in medicinal chemistry. In this investigation, a Schiff base ligand was synthesized by condensing 2-amino-4-methylpyridine with 2-hydroxy-3-methoxybenzaldehyde. Subsequently, its Cu, Zn, and Cd complexes were prepared using both conventional reflux and microwave irradiation methods. The higher product yield from microwave irradiation demonstrates its efficacy compared to the reflux method. The synthesized compounds were then characterized using UV, IR, NMR, mass, and ESR spectroscopy and evaluated for antibacterial, antifungal, anti-diabetic, anti-cancer, and antioxidant activities. All the compounds show appreciable biological activity, in which metal complexes show better activity than the ligand.

Keywords: Schiff base, Pyridine, Microwave, Antibacterial, Antifungal, Antioxidant, Antidiabetic.

Paper Id: A125

Car Damage Detection and Severity Estimation using YOLOv8 Object Detection Model in Deep Learning

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Abstract

Accurately assessing vehicle damage after an accident is essential for speeding up insurance claims and repairs. In this work, we introduce a deep learning-based system that uses the YOLOv8 object detection model to automatically detect and estimate the severity of car damage from photos taken by users. By analyzing these images, the system identifies specific damaged parts and classifies the type and extent of damage, such as scratches, dents, or deformations. The process begins with checking if the image actually contains a vehicle, then uses YOLOv8 to pinpoint the affected areas. To enhance accuracy, predictions from multiple photos of the same vehicle are combined, and a confidence score is assigned to each result. If the confidence is low, the system can flag the case for human review. Our experiments on real-world datasets show that this approach is not only fast but also highly accurate, offering a practical solution for automated car damage assessment.

Keywords— Vehicle Damage Detection, Severity Estimation, YOLOv8, Object Detection, Deep Learning, Computer Vision, Automated Inspection Systems

Paper Id: A126

Thermo-solutal Analysis of Non-Newtonian MHD free Convection Casson Fluid Flow with Some Cross-diffusion Effects

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Abstract

This study investigates magnetohydrodynamic free convection flow of a Casson fluid over an exponentially stretching permeable sheet embedded in a non-Darcy porous medium. Thermal radiation effects are incorporated using the Rosseland approximation, while viscous dissipation and Soret–Dufour cross-diffusion mechanisms are also considered under Newtonian heating boundary conditions. The governing nonlinear partial differential equations are transformed into a system of ordinary differential equations using similarity transformations and solved analytically using the Homotopy Analysis Method. The influence of key physical parameters on velocity, temperature, and concentration distributions within the boundary layer is examined. The results indicate that increasing the Casson parameter suppresses the velocity field while enhancing thermal boundary layer thickness. Thermal radiation and viscous dissipation significantly elevate the temperature distribution, whereas the Soret and Dufour effects strongly influence mass and heat transfer characteristics. The findings provide useful insights for thermal control in engineering systems such as polymer processing, cooling technologies, and biomedical transport phenomena under magnetic environments.

Keywords: Non-Newtonian Casson fluids; Exponentially stretching sheet; Newton heating; Thermal radiation; Cross-diffusion effects; Homotopy Analysis Method.

Paper Id:A127

**SUSTAINABLE AI-DRIVEN CLEAN &
GREENRENEWABLE ENERGY SYSTEM WITH
HYBRID SOLAR-WIND**

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sABSTRACT

Due to substantial generation and demand fluctuations in wind standalone green micro grids, energy management strategies are becoming essential for the power sharing and voltage regulation purposes. The classical energy management strategies employ the Renewable Energy algorithms and rely on batteries in case of possible excess or deficit of energy. However, in order to realize constant current-constant voltage (IU) charging regime and increase the life span of batteries, energy management strategies require being more flexible with the power curtailment feature. In this paper, a coordinated and multivariable energy management strategy is proposed that employs a wind turbine and converters of a wind standalone DC micro grid as controllable generators by adjusting the pitch angle and the switching duty cycles. The proposed strategy is developed as an online nonlinear model predictive control (NMPC) algorithm. Applying to a sample wind standalone dc micro grid, the developed controller realizes the IU regime for charging the battery bank. The variable load demands are also shared accurately between generators in proportion to their ratings. Moreover, the DC bus voltage is regulated within a predefined range, as a design parameter.

Keywords: Wind microgrid energy management using nonlinear model predictive control (NMPC) for optimal power sharing and voltage regulation.

Paper ID:A128

The Historicity of Texts and the Textuality of History: A New Historicist Perspective on Indian Writing in English

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Abstract

Literature like a camera eye, captures the social, political, cultural, and historical contexts of the time in which it was written. This paper examines the central relationship between literature and history through the lens of literary theory, with particular emphasis on New Historicism and its similar approach, Cultural Materialism. The ground breaking perspectives of theorists like Stephen Greenblatt, Michel Foucault, Catherine Gallagher, and Harold Veaser, explores how literary and non-literary texts mutually relate cultural artefacts. The discussion highlights how New Historicism dissolves the fixed boundary between text and context by emphasizing the historicity of texts and the textuality of history. Moreover, by placing context during period of colonialism and partition of India, it tries to draw historical consciousness. After studying Western as well as Indian ideology, the paper argues that literature is not merely influenced by history but actively participates in constructing historical meaning. Finally, the paper concludes literature as a dynamic tool where history, memory, and imagination intersect.

Keywords: New Historicism, Cultural Materialism, Indian Writing in English, Literature and History, Colonialism and Nationalism

Paper ID:A129

Design and Implementation of an Automatic Vehicle Headlight Dimmer System Using LDR

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Abstract: Night driving accidents are often caused by the glare of high-intensity headlights from oncoming vehicles, which reduces the visibility of drivers and causes discomfort. To address this issue, this paper presents the design and implementation of an Automatic Vehicle Headlight Dimmer System that automatically adjusts the intensity of vehicle headlights based on surrounding light conditions. The proposed system uses a Light Dependent Resistor (LDR) sensor to detect incoming light from approaching vehicles and a microcontroller-based control unit to regulate the brightness of the headlight. When high-intensity light from another vehicle is detected, the system automatically dims the headlight, and when the light intensity decreases, the headlight returns to its normal brightness. The system is implemented using simple electronic components and embedded programming, making it cost-effective and efficient for real-time operation. The proposed design improves driver safety, reduces glare-related accidents, and provides a practical solution for intelligent automotive lighting systems.

Key words: Automatic Headlight Dimmer, Light Dependent Resistor (LDR), Night Driving Safety, Vehicle Glare Reduction, Embedded System

Paper Id: A130

DEEP FAKE VIDEO DETECTION USING DEEP LEARNING

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Abstract

In recent years, the rapid advancement of deep learning technologies has led to the emergence of deepfake videos, where artificial intelligence techniques are used to manipulate or synthesize visual and audio content with high realism. While these synthetic media can be used for entertainment and artistic purposes, they pose serious threats in terms of misinformation, identity theft, and cybersecurity. This project focuses on the detection of deepfake videos by leveraging a hybrid deep learning model that combines Residual Network with Long Short-Term Memory (LSTM) networks. The proposed approach extracts spatial features using Convolutional Neural Networks (CNNs), capturing subtle inconsistencies in facial expressions and textures across frames. These spatial features are then passed into LSTM units to learn temporal dependencies and detect abnormalities in motion and transitions that are common in deepfake videos. The integration of ResNet and LSTM ensures both frame-level and sequence-level analysis, significantly improving detection accuracy. The system is trained and evaluated on standard deepfake datasets, demonstrating robustness and high precision in differentiating between authentic and manipulated video content. With the increasing capabilities of deep learning and generative models, the manipulation of multimedia content—specifically videos—has become significantly more realistic and accessible. Among the most concerning applications of such technologies are deepfake videos, which involve the use of artificial intelligence to create highly convincing forged videos, often by replacing a person's face or voice with another's. These manipulated videos have raised major concerns in fields such as politics, media, security, and personal privacy, as they can be used to spread misinformation, damage reputations, or manipulate public opinion. As a result, there is a growing need for reliable and accurate systems to detect and mitigate the threat of deepfakes. This project proposes an advanced deep learning-based framework for deepfake video detection, combining ResNet and Long Short-Term Memory (LSTM) networks. The hybrid model is designed to analyze both spatial and temporal aspects of a video, which are crucial for identifying inconsistencies commonly found in manipulated content. First, the ResNet component is employed to extract rich spatial features from video frames, capturing fine-grained details in facial structures, expressions, and textures. These features are crucial because deepfakes often introduce visual artifacts, such as unnatural skin tones, inconsistent lighting, or abnormal eye movements, which may not be apparent to the human eye but can be learned by convolutional layers.

Keywords— Deepfake Detection, Residual Network, LSTM (Long Short-Term Memory), Video Forensics, Temporal Analysis, Convolutional Neural Networks (CNN), Fake Media, Face Manipulation, Sequence Modeling

Paper Id: A131

Intelligent Predictive Analytics on Big Data for Stock Market Analysis

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Abstract

The exponential growth of high-frequency financial data, encompassing tick data, news streams, and social sentiment, has rendered traditional analytical tools obsolete due to their inability to process massive data volumes, capture complex non-linear market dynamics, and adapt to volatile regime shifts. This research presents a novel intelligent analytics framework that integrates cutting-edge deep learning architectures to address these fundamental challenges in stock market prediction. The proposed system combines Temporal Fusion Transformers for advanced sequence modeling, Graph Neural Networks (GNNs) for capturing intricate cross-asset correlations and market structure dependencies, and Diffusion Models for probabilistic scenario generation and uncertainty quantification. To overcome data privacy concerns inherent in financial institutions, the framework employs federated learning with differential privacy mechanisms, enabling collaborative model training across distributed data sources without compromising sensitive information. Additionally, a reinforcement learning layer optimizes adaptive trading strategies by considering real-world constraints including transaction costs and market impact. The system is architected on a scalable big data pipeline utilizing Apache Spark for petabyte-scale, multi-modal data processing with sub-millisecond latency. An integrated explainable AI (XAI) layer incorporating SHAP and LIME provides transparent, regulatory-compliant interpretations of model decisions and market causality relationships. Experimental evaluation on terabyte-scale heterogeneous financial datasets demonstrates a 83.7% improvement in prediction accuracy and 91.2% enhancement in risk-adjusted returns compared to state-of-the-art benchmarks. The framework establishes a new paradigm for real-time, explainable financial market intelligence with production-ready MLOps capabilities for institutional deployment.

Keywords: Stock Market Prediction, Big Data Analytics, Deep Learning, Transformer Networks, Graph Neural Networks, Diffusion Models, Federated Learning, Explainable AI, Time Series Forecasting, High-Frequency Trading, Risk Management

Paper Id: A132

Design of Hybrid Renewable Energy System for Drive a Single-Phase Induction Motor

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ABSTRACT

The dependence on finite and polluting fossil fuels calls for the use of alternative and more sustainable energy sources such as solar and wind power. However, these energy sources are prone to several challenges, especially for motor drive applications. In this regard, the authors propose the design and simulation of a hybrid renewable energy system (HRES) with battery storage for driving a single-phase induction motor with high precision. The proposed system comprises solar and wind power sources, high-gain DC-DC converters, and advanced Maximum Power Point Tracking (MPPT) algorithm. To maintain the accuracy and stability of motor performance, even with changing environmental conditions, a closed-loop speed control mechanism is integrated. The hybrid approach is validated using the MATLAB/Simulink model. From the results, it is confirmed that the grid voltage is stabilized with current waveforms and a peak voltage of 325V, thereby improving the efficiency and performance of the system. This hybrid renewable energy system is suitable for contemporary motor drive applications, both for industrial and domestic needs, thereby eliminating the disadvantages associated with conventional converters.

Keywords— Hybrid Energy, Single-Phase Motor, MPPT, Closed-Loop Control, MATLAB/Simulink.

Paper Id: A133

Smart Distribution Transformer Load-Balancing system

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ABSTRACT

This project proposes a Smart Distribution Transformer Load Balancing system designed to optimize the management of parallel transformers based on real-time load demand data. The system's architecture is centered around an ESP32 microcontroller, which acts as the primary processing unit. It continuously monitors key electrical parameters such as voltage, current, and real power using a high-precision PZEM-004T module. To ensure operational safety and efficiency, a DS18B20 digital temperature sensor is also integrated for real-time thermal monitoring of the transformers. This project proposes a Smart Distribution Transformer Load Balancing system designed to optimize the management of parallel transformers based on real-time load demand data. The system's architecture is centered around an ESP32 microcontroller, which acts as the primary processing unit. It continuously monitors key electrical parameters such as voltage, current, and real power using a high-precision PZEM-004T module. To ensure operational safety and efficiency, a DS18B20 digital temperature sensor is also integrated for real-time thermal monitoring of the transformers. The system incorporates a dynamic control logic that assigns a primary transformer to handle low-load conditions and minimize no-load losses. As the load increases beyond predefined thresholds, the ESP32 activates auxiliary transformers using Solid State Relays (SSRs). Data is displayed locally via an OLED display and remotely through an IOT-based web server. Although the prototype is designed for resistive loads, the solution is scalable and cost-effective, enhancing grid reliability and transformer lifespan.

Keywords-Smart Distribution System, Transformer Load Balancing, Parallel Transformers, ESP32 Microcontroller. Relay Control, Real Power Measurement, Resistive Load, OLED Display, Automatic Load Management.

Paper Id: A134

DESIGN AND ANALYSIS OF SOLAR DRY SYSTEM BY USING POROUS MEDIUM

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Abstract

A solar drying system using a porous medium is designed and analyzed for domestic-scale food preservation applications. The system utilizes solar energy to heat air, which then passes through a porous medium such as metal mesh, gravel, or packed porous plates. The porous medium increases heat transfer area, enhances thermal storage, and promotes turbulent airflow, resulting in higher air temperature and improved drying efficiency compared to conventional solar dryers. The dryer typically consists of a flat-plate solar air collector, a porous absorber layer, a drying chamber with trays, and a natural or forced convection airflow arrangement. Performance analysis focuses on temperature rise, moisture removal rate, drying time, and thermal efficiency under varying solar radiation and airflow conditions. Experimental and analytical results indicate that the use of a porous medium significantly improves heat retention and uniform air distribution, leading to faster and more uniform drying of agricultural products such as vegetables, fruits, and spices. The system is simple in construction, low-cost, environmentally friendly, and suitable for household use, reducing dependence on electrical dryers and minimizing post-harvest losses.

Keywords: Solar drying system, Porous medium, Solar air collector, Heat transfer enhancement, Thermal efficiency.

Paper Id:A135

An Autonomous AI Systems for Detecting Hallucinations in LLMs

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ABSTRACT

An Autonomous AI System for Detecting Hallucinations in Large Language Models using a Natural Language Inference (NLI) approach. The main objective of the system is to verify whether the generated responses are logically supported by factual information. The system analyzes the relationship between the user's question and the generated answer to determine whether the response is correct, unsupported, or contradictory. Large Language Models (LLMs) are widely used in modern Artificial Intelligence applications such as chatbots, virtual assistants, and automated question-answering systems. These models can generate human-like responses, but they sometimes produce incorrect or fabricated information, which is known as hallucination. Hallucination occurs when the model generates responses that appear meaningful but are not supported by factual knowledge. This issue reduces the reliability and trustworthiness of AI systems, especially in applications where accurate information is important. Therefore, detecting and reducing hallucinations has become a significant challenge in the development of LLM-based systems. The NLI model plays a key role in this system. It classifies the relationship between two pieces of text into three categories: entailment, contradiction, or neutral. If the generated response is logically supported by the available information, it is considered valid. If the response contradicts or is not supported by evidence, the system identifies it as a hallucinated output. In such cases, the system avoids presenting misleading information to the user. Another important feature of the system is its ability to identify the type of query. The system is designed to answer only meaningful factual questions. If the user asks informal, nonsensical, or irrelevant questions, the system will not attempt to generate an answer. Instead, it will provide a response indicating that the query cannot be processed reliably. Overall, the proposed system improves the reliability and factual consistency of LLM responses by combining response generation with an automated verification mechanism. By reducing hallucinations and preventing misleading outputs, this system helps build more trustworthy AI applications for real-world use.

Keyword: Large Language Models, Hallucination Detection, Natural Language Inference (NLI), Question Answering System.

PAPER ID: A136

A DATA-DRIVEN SCHOLARSHIP MANAGEMENT ECOSYSTEM

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ABSTRACT

The Data Driven Scholarship Management Ecosystem is designed to improve the efficiency, transparency, and accessibility of scholarship management in educational institutions. Traditional scholarship processes are often handled manually, which can lead to delays, data inconsistencies, and difficulties in tracking applications. The proposed system introduces a centralized digital platform that automates the entire scholarship lifecycle, including student registration, application submission, document verification, approval, and status tracking. By using data-driven techniques, the system collects and analyzes student information to support fair and efficient scholarship distribution. The platform provides separate modules for students and administrators, enabling students to apply for scholarships and monitor their application status while allowing administrators to manage applications through an organized dashboard. This ecosystem reduces paperwork, minimizes human errors, and enhances transparency in the scholarship process. The proposed system offers a scalable and reliable solution for educational institutions to manage scholarship programs effectively in a digital environment.

Keywords - Scholarship Management System, Data-Driven Decision Making, Educational Data Analytics, Web-Based Application, Student Information Management, Automated Scholarship Processing

Paper Id: A137

EVALUATION OF ORGANIC FEED FORMULATIONS ON BLACK SOLDIER FLY LARVAL GROWTH

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ABSTRACT

This study examines the growth performance of BSF larvae fed with various types of organic feed formulations derived from natural organic materials. These include beer waste, sago waste, food waste, and algae. Various experimental batches were conducted using *Bacillus subtilis* cultures, EM culture, and yeast to treat the feeds, which enhanced the growth of the larvae in a short period of time. Twelve experimental batches were prepared, and the growth of the larvae was monitored by measuring average daily weight. The results showed variations in the larvae's growth patterns through different combinations. Some combinations accelerated growth, while others did not result in the desired growth or weight, due to imbalanced nutrient content or environmental factors. This study underscores the potential of bio-converted organic waste for sustainable larvae biomass production and supports the goals of responsible waste management and food security in line with Sustainable Development Goals (SDG 2 and SDG 12). The results showed that formulations with EM and yeast enhanced larval growth compared to other remaining feed formulations.

Keywords: *Black Soldier Fly (BSF), Organic Waste, Larval Growth, Feed Formulations, Bacillus subtilis, EM Culture, Yeast, Biomass Production, Waste-to-Protein, Circular Economy, Insect Farming.*

Paper Id: A138

AWARENESS OF DIGITAL MONEY LAUNDERING RISKS AMONG ADULTS

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Abstract

Digital money laundering represents an evolving financial crime threat that demands heightened awareness among adult populations in developing economies. This study examines awareness levels regarding digital money laundering risks among 155 respondents across selected Indian districts during February 2026. Employing a cross-sectional descriptive design with non-probability convenience sampling, primary data were collected through a structured online questionnaire. Respondents were assessed on their familiarity with money laundering terminology, awareness of legal consequences of permitting unauthorized account access, knowledge of multi-account transfer schemes used for concealment, and cognizance of appropriate actions to take upon encountering suspicious transactions. Cross-tabulation analysis with Chi-square tests was conducted using IBM SPSS to examine variations across demographic and behavioral categories. The findings reveal substantial variations in awareness levels across gender, occupation, scam exposure, and financial behavior patterns. Notably, awareness of legal consequences and suspicious transaction reporting procedures showed differential adoption across respondent groups. The study emphasizes the critical need for targeted digital financial literacy interventions addressing money laundering risks, particularly among occupational groups demonstrating lower awareness levels.

These findings contribute to the broader discourse on digital financial crime prevention and consumer protection in rapidly digitizing economies. The research underscores the importance of regulatory and educational frameworks that enhance public awareness of emerging fintech-enabled financial crimes.

Keywords: Digital Money Laundering, Financial Awareness, Consumer Protection, Cross-Sectional Analysis, Financial Literacy, India.

Paper Id: A139

Smart Water Leakage Detection

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Abstract

Smart Water Leakage Detection and Control Systems have become an essential solution in modern water management, enabling efficient monitoring and prevention of water loss in supply pipelines. With the increasing demand for water resources and the challenges associated with aging infrastructure, detecting leakages at an early stage is crucial for sustainable resource management. This system utilizes sensor-based technologies such as flow sensors and pressure sensors, integrated with microcontroller units, to continuously monitor water flow conditions and identify abnormal variations. Its ability to analyze real-time data and detect hidden leakage patterns significantly improves the efficiency of water distribution systems. This paper presents a comprehensive analysis of a smart leakage detection system designed for real-time monitoring and automated control in water supply lines. It explores system architecture, sensor integration, and detection methodologies, along with practical applications in residential, municipal, agricultural, and industrial water networks. In addition, a prototype model is implemented to evaluate system performance in leakage detection and response time. The study further discusses key advantages, limitations, and future enhancements of intelligent water management systems, contributing to the development of sustainable and efficient water resource utilization.

Keywords: Smart Water Leakage Detection, Sensor-Based Monitoring, IoT, Microcontroller, Flow Analysis, Pipeline Management

Paper Id: A140

Multimodal Deep Learning Framework For Early Parkinson's Detection

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Abstract

Parkinson disease (PD) is a neurological condition that predominantly involves persons in terms of their movements, speech and handwriting. The symptoms at the initial stages include minor alteration in the speech, handwriting and walking, which are not hard, and may be noticeable at all. Consequently, early diagnosis is problematic. Thus, there is the necessity of proven and non-invasive methods that can be used to detect Parkinson disease at a young age. The paper is a proposal of a deep learning model equipped with multimodality to perform early detection of the Parkinson disease when speech, handwriting and gait data is used. The data of these various sources is first cleaned up to remove noise and locate useful features. The model used is a deep learning algorithm, Squeeze-and-Excitation Residual Network with One-Dimensional Convolutional Neural Network (SE-ResNet ID CNN) to analyze the sequential patterns of the data, and to determine the features related to the Parkinson disease. The overall performance of the classification is improved by combining the characteristics of different modalities. The findings prove that the multimodal method approaches are more accurate and have a higher level of reliability in detection as opposed to the single-modal methods that make use of a single type of data. This proposed system is an affordable and noninvasive method through which doctors can detect the presence of Parkinson disease at its early stages.

Keywords: Parkinson's Disease, Multimodal Deep Learning, Speech Analysis, Handwriting Analysis, Gait Analysis, SE-ResNet, 1D CNN, Early Detection.

Paper Id: A141

Enhanced Multi Attention-Net with Frequency-Aware Squeezed Residual Blocks for Robust Face Anti-Spoofing

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Abstract

Face recognition systems are widely deployed in authentication, surveillance, and financial applications. However, these systems remain highly vulnerable to presentation attacks such as printed photos, replayed videos, and 3D masks. Existing CNN-based anti-spoofing approaches often suffer from poor cross-dataset generalization due to environmental variations and unseen spoof patterns. This paper proposes an Enhanced Multi-Attention Network with Frequency-Aware Squeezed Residual Blocks (EMAN-FASRB) to improve robustness against face spoofing attacks. The proposed architecture integrates spatial, channel, and frequency attention mechanisms with lightweight residual learning to capture both spatial textures and frequency-domain spoof artifacts. Experiments conducted on benchmark datasets including CASIA-FASD, Replay-Attack, and MSU-MFSD demonstrate improved performance in terms of EER, HTER, ACER, and AUC. Results confirm superior cross-dataset generalization and computational efficiency compared to baseline CNN models.

Keywords: Face Anti-Spoofing, Presentation Attack Detection (PAD), Deep Learning, Multi-Attention Network, Frequency-Aware Feature Extraction, Residual Learning, Cross-Dataset Generalization, Biometric Security

Paper Id: A142

A Systematic Survey on Hybrid Machine Learning Models for Domestic Electrical Energy Forecasting

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Abstract

The accurate measure of electricity consumption in the household is important to an extent to which the smart grids will perform, as well as the strategies to scale down the demand and conserve power. Rather than using a single approach, more recent methods combine statistical instruments, machine learning, but also deep learning to accomplish this more effectively. The next thing to follow here is the close examination of these combined models with the aim to predict the household energy requirement. By reading existing literature, there is an apparent categorization - one of blends of statistics with neural networks, relation of deep and regular machine learning, strategy based on breakdown steps, even group-style strategies in collaboration. A glance at the comparisons between studies shows that they vary in data sources, predictive horizons, measures of success and architecture. Hybrid systems are more likely to perform better than standalone statistical, machine learning, or deep learning methods - regardless of whether the forecasts are in the near term, middle-range, and distant. Whilst this is an improvement, there are still issues: incorrect or inaccessible data, models that are difficult to get in between homes, high computing requirements, unclear decision-logic, and the lack of a uniform testing policy. Due to these gaps, the focus is shifted to the shared benchmark structures, knowledge application across home types through transfer mechanisms, simpler hybrid structures, models the reasoning process of people uses, tools to deal with uncertain situations, and live updating as it runs. What now comes out is a systematized summary that favours the perspective of individuals who seek smarter household energy Forecasting and smart control measures.

Keywords: Machine Learning, Forecasting, Smart Grid, Deep Learning, Regression, Hybrid Model

Paper Id: A143

Lung Cancer Detection using Optimized Feature Extraction from Medical Images

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Abstract

Lung cancer detection has become a critical research area due to the increasing number of cancer-related deaths worldwide. Machine learning and deep learning techniques play a significant role in improving the accuracy and efficiency of medical image analysis. This paper presents an automated lung cancer detection system using optimized feature extraction from CT scan images. The proposed model utilizes EfficientNet as a deep feature extractor to capture high-level spatial and texture-based features from lung images. Since the extracted features are high-dimensional and may contain redundant information, Dung Beetle Optimization (DBO) is employed for effective feature selection. This optimization technique reduces feature dimensionality and selects the most relevant features, thereby improving computational efficiency and classification performance. The optimized features are then fed into a classifier to distinguish between cancerous and non-cancerous cases. The system is evaluated using performance metrics such as accuracy, precision, recall, F1-score, and confusion matrix. Experimental results indicate that the proposed approach enhances detection accuracy and reduces overfitting compared to conventional CNN-based models. Furthermore, preprocessing techniques including noise removal, contrast enhancement, and normalization are applied to improve image quality and model performance. The integration of deep learning with metaheuristic optimization provides a robust and efficient framework for early-stage lung cancer detection.

Keywords: Lung Cancer Detection, Deep Learning, EfficientNet, Dung Beetle Optimization (DBO), Feature Selection, CT Scan Image Analysis

Paper Id: A144

An Automated System for Legal Document Summarization Using Deep Learning

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Abstract

The rapid growth of digital documents has created a need for efficient systems to process and analyze large volumes of textual information. In Tamil Nadu, many important documents such as legal case records, government land ownership records and land classification records, and academic research papers are written in the Tamil language. These documents are often lengthy and contain complex legal or administrative terminology, making them difficult and timeconsuming for users to read and understand. This project proposes an Automated Tamil Legal Document Summarization System using Deep Learning and Natural Language Processing (NLP) techniques. The system is designed to automatically generate concise and meaningful summaries from large Tamil documents while preserving the essential information and context. The proposed model processes documents through multiple stages including document input, Optical Character Recognition (OCR) for scanned documents, text preprocessing, feature extraction, and deep learning-based summarization. The OCR module extracts Tamil text from scanned images or PDF documents and converts it into machine-readable format. The preprocessing module then cleans and organizes the text by removing noise, special characters, and irrelevant words. After preprocessing, Natural Language Processing techniques are applied to analyze the document structure and identify important keywords and sentences. A deep learning-based summarization model .

Keywords: Deep Learning, Natural Language Processing (NLP), Optical Character Recognition (OCR), Text Preprocessing.

Paper Id: A145

Deep Learning Based Intrusion Detection with Multilayer Perceptron

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Abstract

Traditional Intrusion Detection Systems (IDS) have proven increasingly ineffective against the complexity and scale of modern cyber threats. Signature-based and rule-based approaches are unable to detect zero-day exploits and adaptive intrusion techniques. Furthermore, such systems are prone to high false positive rates and lack scalability, limiting their deployment in real-time, high-speed network environments. This paper proposes a real-time Intrusion Detection System based on Deep Learning, utilizing a Multilayer Perceptron (MLP) model trained on the NSL-KDD dataset. The MLP model is designed to classify network traffic into normal and various attack categories, including Denial of Service (DoS), Probe, and Remote to Local (R2L). Deep learning enables the system to extract and learn complex traffic patterns, significantly improving detection accuracy and reducing false alarms. The system architecture employs a client-server communication model using lightweight Python-based socket programming. The client simulates network traffic and transmits data to the server, where the trained MLP model processes and classifies the traffic in real time. The detection output is displayed on the server and can be extended to log-based or graphical interfaces for monitoring and alerting. Key advantages of the proposed system include high detection accuracy, real-time responsiveness, and flexibility. Its modular and lightweight design ensures ease of deployment in diverse environments. Additionally, the system supports model retraining, enabling adaptation to evolving threats and newly discovered attack patterns. Experimental results demonstrate the model's capability to perform efficient, real-time intrusion detection with reduced false positives. This system presents a scalable and practical solution to modern cybersecurity challenges by integrating deep learning techniques with real-time network analysis.

Keywords: Intrusion Detection System, Deep Learning, Multilayer Perceptron, NSL-KDD, Cybersecurity, Real-Time Detection, Network Security, Socket Programming.

Paper Id: A146

MediSentry: An AI-Powered Clinical Decision Support System for Medication Safety and Risk Prediction

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Abstract

Medication safety remains a significant challenge in modern healthcare environments, particularly in contexts characterised by polypharmacy, complex comorbidities, allergy constraints and rising antimicrobial resistance (AMR). Traditional clinical decision support systems predominantly rely on static rule-based databases that identify only documented drug– drug interactions (DDIs), often generating excessive noncritical alerts and contributing to clinician alert fatigue. Furthermore, DDI prediction is computationally combinatorial, requiring evaluation of up to $n(n-1)/2$ interaction pairs for prescriptions with n drugs, creating scalability challenges for real-time clinical use. This paper introduces MediSentry, an AI driven clinical decision support framework that enhances prescription safety through predictive modelling, contextual risk classification, deterministic safety enforcement and explainable decision support. It integrates a deep-learning DDI predictor with a gradient boosting classifier to categorise prescriptions as “SAFE”, “MEDIUM” or “HIGH” risk. A rule engine enforces allergy, contraindication and AMR constraints, whereas a retrieval augmented generation–inspired module generates evidence-based explanations. The long short-term memory model further forecasts institutional prescribing risk trends. The system is built on a three-tier software architecture with secure representational state transfer integration and human-in-the-loop verification, exhibiting strong recall and precision on the BioSNAP ChCh-Miner dataset. The results show that combination of probabilistic models, rule-based safeguards and explainable AI in this framework enhances medication safety and clinical oversight.

Keywords: Drug-Drug Interaction, Antimicrobial Resistance, Deep Learning, Machine Learning, Rule-based Expert System, Retrieval Augmented Generation.

Paper Id: A147

Synthesis of Carbon Quantum Dots (CQDs) extracted from Shrimp Shell and its application in heavy metals and pesticide detection.

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Abstract

Heavy metal contamination in water is a serious environmental concern because these metals are toxic, persistent, and capable of bioaccumulation in living organisms. In addition to heavy metals, xenobiotic components present in pesticides also pose a significant threat to environmental and biological systems. These synthetic compounds are resistant to natural degradation and can persist in soil and water for extended periods, leading to ecological imbalance and potential health risks for aquatic organisms, animals, and humans. Continuous exposure to such xenobiotic pesticides may cause neurotoxicity, endocrine disruption, and other adverse biological effects. Therefore, the development of simple, rapid, and sensitive detection methods for both heavy metals and xenobiotic pesticide contaminants is essential for effective environmental monitoring. This study, environmentally friendly carbon quantum dots (CQDs) were synthesized from chitosan derived from shrimp shell waste using a simple aqueous synthesis method that yielded fluorescent nanoparticles. The optical properties of the synthesized CQDs were analyzed using Fluorescence Spectroscopy, which revealed a strong fluorescence emission peak at approximately 360 nm, confirming the formation of CQDs with excellent photoluminescent characteristics. Structural and functional group analysis was carried out using Fourier Transform Infrared Spectroscopy and X-ray Diffraction. FTIR results indicated the presence of hydroxyl ($-OH$), amino ($-NH_2$), and carbonyl ($C=O$) functional groups, suggesting successful surface functionalization of the CQDs. XRD analysis showed both amorphous and crystalline characteristics, with approximately 64.5% amorphous structure and 35.5% crystalline nature, indicating the formation of nanoscale carbon structures. The sensing capability of the synthesized CQDs was evaluated for environmental monitoring applications. The CQDs exhibited strong fluorescence that was selectively quenched in the presence of Fe^{3+} ions, demonstrating their potential for heavy metal detection. Furthermore, the CQDs were used for the detection of xenobiotic pesticide compounds, where significant fluorescence quenching was observed upon interaction with the pesticide Imidacloprid. This fluorescence quenching behavior indicates the potential of CQDs as a sensitive fluorescent nano sensor for detecting xenobiotic contaminants. Overall, this environmentally sustainable approach converts shrimp shell waste into valuable fluorescent nanomaterials for the detection of both heavy metals and pesticide contaminants in water systems.

Keywords: CQDs, heavy metals, imidacloprid, fluorescence, chitosan

Paper Id: A148

Smart Emergency Transportation and Alert System

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Abstract

Road safety is a critical challenge in urban and highway infrastructure management. The increasing rate of road accidents demands an intelligent and rapid-response system that integrates advanced technologies to enhance emergency intervention. This paper presents an AI-powered accident detection and alert system designed to automatically identify accidents, assess severity, and notify emergency responders with real-time location data. The proposed system leverages sensor-based monitoring, real-time image analysis, and GPS integration to detect accidents without reliance on internet connectivity. It employs AI-driven algorithms to classify accident types and autonomously generate alerts for nearby control centres, facilitating a swift emergency response. The system is optimized for deployment on highways and urban road networks, ensuring seamless integration with smart city infrastructure. From a civil engineering perspective, this innovation enhances traffic safety by enabling proactive intervention strategies. It also provides valuable data for accident-prone zone analysis, assisting planners in designing safer roadways and optimizing traffic management. By incorporating AI and smart detection techniques into transportation infrastructure, this system contributes to reducing fatalities and improving post-accident response efficiency, aligning with the vision of sustainable and intelligent urban development.

Keywords: Road safety, Artificial Engineering, Smart accident detection.

Paper Id: A149

Detecting Hate Speech and Offensive Language

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Abstract

In today's digital era, the internet has become a powerful medium for communication and information sharing, but it has also led to a significant rise in the spread of hate speech, threatening online safety and societal well-being. This project addresses the critical challenge of detecting hate speech automatically by exploring a Support Vector Machine (SVM)-based approach that delivers near state-of-the-art performance. The task is complicated by the nuanced nature of language, inconsistent definitions of hate speech across cultures, and limited availability of annotated data. To overcome the computational limitations of traditional SVMs when handling large or non-linear datasets, kernel approximation techniques are employed, enabling efficient training and improved scalability. Additionally, the project incorporates sentence embedding techniques such as Word2Vec, GloVe, FastText, and Sentence Transformers to convert textual data into dense vector representations that capture both semantic and syntactic meaning. These embeddings enhance the system's ability to understand context and improve classification accuracy. Despite encouraging results, challenges such as model interpretability and domain adaptation persist. This project not only contributes to the development of effective hate speech detection models but also emphasizes the importance of transparency, ethics, and explainability in creating safer online environments.

Keywords— Hate Speech Detection; Support Vector Machine (SVM); Kernel Approximation, Sentence Embeddings; Word2Vec; GloVe, FastText, Sentence Transformers; Text Classification; Natural Language Processing (NLP); Machine Learning.

Paper Id: A150

A Systematic Review of Secure Communication Frameworks for Smart Meter Data in Cyber Physical Smart Grid Environments

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Abstract

Smart grid technology has significantly transformed traditional power systems by enabling intelligent, bidirectional communication between smart meters and utility infrastructures. However, the increasing integration of digital communication networks has introduced substantial cybersecurity challenges, particularly in smart meter data transmission. This paper presents a comprehensive review of security mechanisms employed in smart meter communication systems within smart grids. The review systematically analyzes cryptographic techniques including AES, RSA, ECC, Paillier, and hybrid encryption schemes, along with blockchain-based decentralized frameworks and differential privacy approaches for data protection. Furthermore, emerging intelligent security solutions based on artificial intelligence, deep reinforcement learning, and anomaly detection algorithms are examined. The comparative analysis highlights the strengths and limitations of existing approaches in terms of confidentiality, integrity, scalability, computational overhead, and attack resilience. Particular attention is given to multi-parameter false data injection attacks, replay attacks, and data integrity violations, which remain critical challenges in practical deployments. Based on the analysis, significant research gaps are identified, including the limited integration of encryption with real-time AI-based detection, insufficient multi-vector attack modeling, and the need for lightweight yet scalable security architectures. This review provides a structured understanding of current advancements and outlines future research directions toward developing resilient and intelligent smart meter security frameworks.

Keywords: Smart Grid Security, Smart Meter Data Protection, Cryptographic Techniques, Blockchain-Based Security, Artificial Intelligence in Cybersecurity.

Paper Id: A151

Smart Nutrition Recommendation System Using lab reports

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Abstract

Nutrition management plays a critical role in the prevention and control of lifestyle-related diseases such as diabetes, dyslipidaemia, anaemia, and vitamin deficiencies, where personalised dietary guidance significantly improves patient outcomes. This paper presents an AI-powered Smart Nutrition Recommendation System that automates the analysis of clinical laboratory reports and delivers personalised nutrition plans through a three-phase intelligent pipeline. In Phase 1, lab reports in PDF or image format are processed using OCR-based text extraction via pytesseract and PyMuPDF, followed by regex-driven biomarker identification and clinical value validation against published reference ranges. In Phase 2, a Random Forest health classifier and a LightGBM nutrient predictor assess patient risk and predict personalised daily nutrient targets, with SHAP-based explainability providing transparent model interpretations for patients and clinicians. In Phase 3, a deterministic clinical rule engine detects critical biomarker values and generates validated JSON health summaries forwarded to the Google Gemini large language model, which produces a comprehensive diet plan, weekly meal plan, recipes, grocery shopping list, supplement recommendations, and lifestyle advice. The system is deployed as a Flask web application with a REST API and an AI nutrition chatbot, and experimental validation confirms accurate biomarker extraction, clinically consistent risk classification, and personalised recommendations tailored for elevated LDL, low Vitamin D, Indian cuisine preference, and dietary allergy constraints.

Keywords: Machine Learning, Random Forest, LightGBM, SHAP Explainability, OCR, Google Gemini, Nutrient Prediction, Personalised Nutrition, Flask.

Paper Id: A152

Performance Evaluation of Zeolite-Based Self-Curing M30 Concrete Under HCl and H₂SO₄ Acid Attack.

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ABSTRACT

Concrete structures are frequently exposed to aggressive acidic environments that can significantly affect their strength and durability. This study evaluates the performance of zeolite-based self-curing M30 grade concrete when subjected to hydrochloric acid (HCl) and sulphuric acid (H₂SO₄) attack. Zeolite is used as a self-curing agent to enhance internal moisture retention and promote continuous hydration of cement, thereby improving the overall durability of concrete without the need for conventional external curing. In this study, concrete cubes were cast with different percentages of zeolite. The control mix (0% zeolite) was subjected to conventional water curing, while mixes containing 5%, 10%, 15%, and 20% zeolite were prepared under self-curing conditions. After 28 days of curing, the cubes were tested for compressive strength using a Compression Testing Machine (CTM) to evaluate the initial mechanical properties of the concrete mixes. After the 28-day curing period, the concrete cubes were immersed in hydrochloric acid and sulphuric acid solutions for 90 days to study the durability performance under acid attack. During this exposure period, the deterioration of concrete was evaluated by measuring the weight loss of cubes, which indicates the level of surface degradation caused by the acidic environment. The weight loss analysis helps in understanding the resistance of different zeolite mixes against chemical attack. The overall study investigates the effectiveness of zeolite as a self-curing material and its influence on the strength, durability, and resistance of concrete when exposed to aggressive acidic conditions. The findings of this research help in identifying the suitable zeolite content for improving the long-term performance of self-curing concrete.

Keywords— Zeolite, PCE Based Superplasticizer, M30 Grade, Compressive Strength, Durability Performance.

Paper Id: A153

Education, Health and Human Capital Development in Rural India: Challenges and Policy Perspectives

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Abstract

Human capital development is widely recognized as a critical driver of economic growth and social transformation. In rural India, education and health constitute the primary pillars of human capital formation and play a decisive role in improving productivity, employment opportunities, and quality of life. Despite numerous policy interventions and development programs, rural areas continue to face significant challenges in access, quality, and equity in education and healthcare services. This study examines the interrelationship between education, health, and human capital development in rural India using a socio-economic analytical framework. The research integrates secondary data analysis with theoretical insights from human capital theory and rural development studies. The findings reveal that disparities in infrastructure, institutional capacity, and socio-economic conditions significantly influence human capital formation. The study emphasizes the need for integrated policy strategies that strengthen rural education systems, improve healthcare infrastructure, and promote inclusive development.

Keywords: Human capital, Rural education, Rural health, Social development, Human development, Rural India, Development policy

Paper Id: A154

A Study on Service Quality of Rapido and Pink Rapido Services among Women Commuters in Chennai

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Abstract

The rapid expansion of app-based bike taxi services has significantly transformed urban mobility in major Indian metropolitan cities. Chennai, characterized by severe traffic congestion and an increasing demand for last-mile connectivity, has witnessed a growing dependence on such services. Among the available platforms, Rapido has emerged as a prominent mobility provider, offering affordable and time-efficient transportation options. To address gender-specific safety concerns, Pink Rapido was introduced as a women-focused service operated exclusively by female captains for female passengers, aiming to provide a safer and more comfortable travel experience for women commuters. This study examines service quality dimensions and user perceptions among women using Rapido and Pink Rapido services in Chennai. The research is based on the SERVQUAL framework, which evaluates service quality through five key dimensions: Tangibles, Reliability, Responsiveness, Assurance, and Empathy. A quantitative research design was adopted to ensure systematic analysis, and primary data were collected from 309 female respondents who had prior experience using these services. Statistical analysis was conducted using SPSS, employing techniques such as correlation and multiple regression analysis. Comparative analysis was carried out using ANOVA and independent samples t-tests, while chi-square tests were applied to examine associations between categorical variables. The findings provide insights into perceived service quality and the key factors influencing service evaluation and commuting preferences among women commuters.

Keywords: SERVQUAL, Bike Taxi Services, Women Commuters, Rapido, Pink Rapido, Service Quality, Chennai, Urban Mobility.

Paper ID: A155

A Study on E-Service Quality in Online Shopping Platforms: An Empirical Study

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ABSTRACT

The rapid expansion of e-Commerce has made a significant impact to the purchasing behaviour of consumers as it has moved purchasing activities from the traditional retail stores to online stores. In this competitive digital marketplace, it has become crucial to keep the quality of service at a high level in order to ensure customer satisfaction and preserve long-term business success. This study examines the relationship between service quality and customer satisfaction in online shopping platforms and customer satisfaction, which has been studied with specific reference to major e-commerce websites viz., Amazon, Myntra and Meesho. The research is based on primary data collected through structured questionnaire through online survey method. A total of 254 valid responses was analysed using statistical tools such as correlation analysis, ANOVA and Chi-square tests through Software package, Statistics method (SPSS). The study results have found that the quality of service plays a significant role in the customer satisfaction process in online shopping environments. Elements such as reliability, information accuracy and efficiency of electronic services impact the overall online shopping experience and contribute to higher levels of satisfaction among customers. The results also show that better quality of service results in better trust from customers and positive behavioural outcomes. Overall, the study indicates that e-commerce platforms need to always increase their service quality standards to achieve greater satisfaction from the customer and maintain their competitive edge in the fast-changing online retail industry.

Keywords: E-service Quality; Customer Satisfaction; Online Shopping; Customer Experience; E-commerce Platforms.

Paper Id: A156

The Influence of Visual and Auditory Cues from Social Media Influencers on Consumers' Purchase Intention Towards Skincare Products: The Mediating Role of Parasocial Interaction.

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Abstract

The impactful growth of influencer marketing through social media channels has deeply transformed the way of consumers interacting with the influencers and brands. The social media influencers use sensory cues such as visual cues and auditory cues in their content promoting products or services that influences the purchase intention of the consumers. This study examines the influence of visual and auditory cues from the social media influencers on consumers' purchase intention towards skincare products, with parasocial interaction being the mediating variable. The study is carried out based on the framework SOR (Stimulus – Organism – Response), visual and auditory cues represent stimuli, purchase intention represent response and parasocial interaction represents organism. Data were collected from 198 respondents from the population of Millennials and Gen Z across different South India States, using a structured questionnaire. CB -SEM analysis is employed to analyse the data collected using SmartPLS. Results show that both visual and auditory cues significantly influence the consumers parasocial interaction with the influencer they are following, and parasocial interaction significantly influences consumers purchase intention. Further, parasocial interaction mediates the relationship between sensory cues used by the influencers and purchase intention. The findings show the importance of sensory communication in influencer marketing and provide insights for the marketers in the skincare industry in deciding their planning collaboration.

Keywords: Influencer marketing, Visual cues, Auditory cues, Parasocial interaction and Purchase Intention.

Paper Id: A157

IMPROVING CANDIDATE SCREENING EFFICIENCY USING DIGITAL TOOLS

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ABSTRACT

Candidate screening is an important stage in the recruitment process because it helps organizations identify suitable and qualified employees. In many organizations, traditional screening methods require a large amount of time, manual effort, and administrative work, which can slow down the hiring process and sometimes lead to errors in decision-making. With the growth of digital technology, many organizations have started using digital tools such as Applicant Tracking Systems (ATS), artificial intelligence-based screening tools, and online assessment platforms to make recruitment more efficient. The main aim of this study is to analyze how digital tools help improve the efficiency and accuracy of candidate screening. The research examines how these technologies reduce manual workload, speed up the screening process, and support better decision-making based on data.

This study uses a quantitative research approach, and data were collected through a survey conducted among employees involved in recruitment activities. Statistical analysis was used to examine the relationship between the use of digital hiring tools and screening performance. The results show that digital tools help organizations screen candidates faster, improve the accuracy of candidate evaluation, and reduce the overall recruitment time. In addition, these tools help recruiters manage applicant information more effectively and make more objective hiring decisions. The study concludes that adopting digital tools in recruitment can significantly improve the efficiency and effectiveness of the candidate screening process.

Keywords: Digital tools, Candidate screening, Recruitment efficiency, HR technology, Applicant Tracking System.

Paper Id: A158

Artificial Intelligence in Treasury Cash Flow Forecasting: A Comparative Performance Analysis of Leading Platforms.

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Abstract:

In today's fast changing business world, many companies find it difficult to manage their cash flow effectively. When it comes to treasury department, cash flow forecasting is done using traditional method of recording which is more time consuming and it does not provide timely forecast. As the result the company may face problems such as cash shortage, poor liquidity planning, or excess of idle cash. The emergence of artificial intelligence (AI) has enhanced the opportunity for the organisations to forecast the accurate data by analysing large volumes of financial data, identifying patterns, and generating real – time prediction. There are more leading AI treasury providers such as Nilus, Kyriba, GTreasury, Trovata, HighRadius and Nomentia which help the organisations treasury team to plan cash flow effectively both in immediate and long-term financial planning which supports more effective liquidity planning and to make better financial decision even in uncertain business environment. Moreover, in multinational companies as they operate in different countries, different currencies, has multiple bank accounts and the transactions happens in different time zones the use of this AI providers can help them to combine data from all the location and analyse the large volumes of transaction quickly as well as to identify the customer payment time lines in different countries which gives a clear view of global cash positions to the treasury team for managing cash more easily and accurately. According to 2024 Deloitte Global cooperate treasury survey use of generative AI in treasury operation is widely adopted by organisations for cash flow forecasting, tracking daily cash positions, and managing market risk. And it also states that the treasury technology as constantly centred on few global vendors like Kyriba, FIS, SAP Treasury and ION. Case study evidence from Nilus shows that AI can automatically categorize more 95% of incoming and outgoing transactions with in a second which once required 30 minutes of manual efforts. This research mainly compares the performance of two AI treasury tools Nilus and Kyriba how effectively it helps the companies to perform cash flow forecasting.

Keywords: Artificial Intelligence, Treasury Management, Cash Flow Forecasting, Machine learning, liquidity management, financial analytics.

Paper Id: A159

Thionated Functional Materials: Promising Candidates for Next-Generation Applications

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Abstract

The synthesis and stabilization of organic radical ions have attracted considerable interest due to their diverse applications as panchromatic and near-infrared (NIR) probes, in batteries, conductors, magnets, and in the fundamental understanding of electron-transfer (eT) processes. Arylene diimides, owing to their intrinsically electron-deficient nature and structural tunability, serve as excellent platforms for generating stable radical species. In this work, we report the synthesis of several classes of thionated naphthalene diimide (NDI) and perylene diimide (PDI)-based molecular systems containing one, two, or three sulfur atoms at the imide positions. Four distinct classes of compounds were investigated: (i) thionated NDIs without core substitution, (ii–iii) thionated NDIs bearing halogen, cyano, or chalcogen substituents at the core positions, and (iv) mono- and bis-thionated PDIs substituted with halogen atoms at the 2,7-bay positions. Notably, two pairs of thionated PDI regioisomers were isolated, displaying subtle differences in their redox and optoelectronic properties. Importantly, this study presents the first investigation of radical anions derived from core- and bay-substituted thionated arylene diimides. The generated radical anions exhibit a wide range of colors, including brown, purple, violet, blue, and intense green, accompanied by significantly red-shifted doublet–doublet transitions. Furthermore, the half-lives of these radical anions increase substantially—by several tens of folds—depending on the degree of thionation and the nature of the core or bay substituents. These persistently stable and readily generated radical anions hold promising potential for applications in redox and photocatalysis, NIR-absorbing materials, and halogen-bonding-driven supramolecular assemblies.

Keywords: Stable Radical Anions, Thionation, Panchromatic-absorbing materials.

Paper Id: A160

GENERATIVE AI FOR DRUG MOLECULE DESIGN

ABSTRACT:

Drug discovery is a complex and time-consuming process that typically requires several years and large financial investments to identify effective therapeutic compounds. Traditional approaches rely on extensive experimental screening of millions of chemical molecules, yet only a few candidates successfully progress to clinical development. To overcome these challenges, this project proposes an Artificial Intelligence based framework for automated drug molecule design using generative deep learning models. The proposed system utilizes Generative AI techniques combined with computational chemistry to generate novel molecular structures with desired pharmacological properties. Molecular datasets obtained from public chemical databases such as ChEMBL and ZINC Database are used to train the model. The molecules are represented using SMILES notation and converted into graph-based structures where atoms act as nodes and chemical bonds act as edges. A Graph-based Variational Autoencoder (VAE) is employed to learn the underlying distribution of valid chemical structures and generate new candidate molecules. The model encodes molecular features into a latent space representation and decodes them to create structurally valid and chemically feasible molecules. To further improve the quality of generated compounds, a reinforcement learning optimization strategy is applied. The reward function evaluates important pharmaceutical properties such as molecular weight, solubility, toxicity, binding affinity, and drug-likeness score. The system filters generated molecules based on predefined chemical constraints and property thresholds to ensure that only promising drug candidates are selected. Finally, the framework predicts and ranks the best candidate molecules, providing the top potential compounds for further experimental validation. The proposed approach significantly reduces the time and computational cost involved in early-stage drug discovery while enabling researchers to explore a larger chemical space efficiently. This project demonstrates how generative deep learning models can assist pharmaceutical research by automatically designing optimized drug-like molecules with desirable biological properties.

Paper Id: A161

Artificial Intelligence-Based Battery Management Systems for Electric Vehicles

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Abstract

The rapid growth of electric vehicles (EVs) has increased the demand for advanced battery management systems (BMS) capable of ensuring safety, reliability and optimal performance of lithium-ion batteries. Efficient battery management is essential for monitoring battery conditions, improving energy utilization and extending battery lifespan. Traditional battery management methods utilize model-based estimation techniques that often struggle to represent the nonlinear behaviour, aging characteristics and varying operating conditions of lithium-ion batteries. Artificial intelligence (AI) has emerged as a powerful approach to enhance battery monitoring and control in EV applications. AI-based battery management systems integrate techniques such as machine learning, deep learning, fuzzy logic and reinforcement learning to perform key battery management functions including thermal management, fault detection and intelligent charging control. These algorithms analyze large volumes of battery data such as voltage, current, temperature and charge discharge cycles to identify complex patterns and accurately predict battery performance and degradation trends. AI-driven BMS frameworks enable real-time battery monitoring, predictive maintenance and adaptive charging strategies that enhance battery efficiency and operational safety. Data-driven models allow battery systems to respond dynamically to changing operating conditions and optimize charging and discharging processes. Integration of artificial intelligence with modern battery management technologies contributes to improved battery lifespan, reduced degradation and enhanced energy management in electric vehicles. These advancements demonstrate the potential of AI-based battery management systems to significantly improve the performance, reliability and sustainability of next-generation electric vehicle battery technologies.

Keywords: Artificial Intelligence, Battery Management System (BMS), Electric Vehicles, Lithium-Ion Batteries, Machine Learning, Deep Learning, Intelligent Charging Control and Energy Management.

PAPER ID: A162

Financial Literacy and Investment Behavior of Indian Students: The Role of Digital Investment Platforms

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Abstract

Digital investment platforms have changed the ways Indian university students have invested their money over the years. Since the launch of mobile apps, students have been able to open accounts, view real-time updates on the market, and make investments for a very low cost, allowing many more students to begin investing at a much younger age. While this is very beneficial when accessing the financial markets, it has also raised concerns about students making poor investments due to poor decision making, overconfidence, and following the market trends without understanding them. As such, this study attempts to examine the relationship between financial literacy and the investment behavior of students in India, and how investment platforms affect their investment behavior. The primary aim of this study was to gain an understanding of students' knowledge of finance, their investment choices, and the decision-making process they go through when making investment decisions. To meet these objectives, this study employed descriptive research design and collected primary data using structured questionnaires and simple random sampling from 101 students from around the country. The questionnaire asked students about their knowledge of finance, investment options and use digital platforms, their level of risk tolerance, factors that could affect investment decisions and how to manage their investments.. Data collected from the questionnaire was analyzed using descriptive statistics, chi-square analysis and regression analysis to determine how financial literacy relates to the use of digital investment platforms, as well as how financial literacy relates to student investment behavior. Results showed that students with an interest in finance are more likely to make informed investment decisions; they will also be more likely to diversify their assets, to use a systematic investment approach and have a greater focus on their long-term financial goals..In addition, the study showed that students who use digital investment platforms more often tend to participate in short-term trading and trend investing, particularly when it comes to students who have a low level of financial literacy. The analysis also showing that financial literacy contributes to avoiding impulsive and emotional investment decisions regardless of whether you frequently use digital investment platforms. In summary, the research highlights that digital investment platforms have both positive and negative effects; While they support easier investing, they also create a greater chance to make incorrect investment decisions due to the lack of adequate financial knowledge on behalf of students. The need for students to have access to improved financial literacy to make sound and responsible investment decisions is also an emphasis of this research.

Keywords: Financial Literacy, Investment Behavior, Digital Investment Platforms, Indian Students, Behavioral Finance.

Paper ID: A163

A Hyper-Local Electricity Demand Forecasting Framework Using LSTM, Prophet, and Ensemble Models

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Abstract

To keep the power grid stable and to distribute electricity efficiently, we need to have precise short-term forecasts for the amount of electricity we will need in the future. In this paper, we propose a hybrid model that combines a Forecasting Model called Prophet with a Long and Short Term Memory (LSTM) neural network based on deep learning to provide more accurate localized demands for determining electricity usage in those regions. The hybrid model utilizes previous demand data and other environmental variables, such as temperature and humidity, to generate forecasts on an hourly basis for 48 hours before their expected use. By using Prophet to account for data seasonality and long-term trends and LSTM to deal with the more complicated non-linear patterns of the data, we are able to get more accurate short-term forecasts of how much electricity we will need in a particular geography. Based upon the results of comprehensive experiments using the Mean Absolute Error (MAE), Root Mean Square Error (RMSE), and the Mean Absolute Percentage Error (MAPE), we found that the combined forecast generated by this ensemble model outperforms the forecasts from the two respective individual models. This new model should help utilities manage local grids in a better way and make better predictions for long-term energy needs.

Keywords: Electricity demand forecasting, short-term load forecasting, hyper-local forecasting, time-series analysis, deep learning, Long Short-Term Memory (LSTM), weather-based forecasting, smart grid, feature engineering, energy analytics.

Paper Id: A164

A HYBRID AI-BASED INTRUSION DETECTION AND AUTOMATED RESPONSE SYSTEM FOR NETWORK SECURITY

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Abstract

The rapid growth of cyber threats and increasing complexity of network systems have made traditional intrusion detection methods less effective. This paper presents a hybrid AI-based intrusion detection and automated response system for enhancing network security. The proposed system combines a deep autoencoder for anomaly detection and an XGBoost classifier for accurate traffic classification. Additionally, a reinforcement learning agent based on Proximal Policy Optimization (PPO) is used to automatically select appropriate response actions such as allow, block, alert, and quarantine. The system is evaluated using the CIC-IDS2017 dataset and achieves high accuracy with a low false positive rate. It also includes real-time monitoring, alert generation, and incident reporting features. The proposed approach provides an efficient, scalable, and intelligent solution for proactive cyber threat detection and mitigation. The system is designed to handle large-scale network environments with high efficiency. It ensures faster decision-making and reduced response time during cyber attacks. This improves overall network resilience and security management. Furthermore, the integration of multiple AI techniques enables the system to adapt to evolving attack patterns and improve decision-making over time. This enhances the overall reliability and robustness of the network security framework, making it suitable for real-world deployment in dynamic and large-scale environments.

Keywords: Artificial Intelligence, Intrusion Detection, Machine Learning, Deep Learning, Reinforcement Learning, Network Security, XGBoost, PPO.

Paper Id: A165

Development of a Cyber-Resilient Blockchain Model for Secure Medical Data Sharing.

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Abstract

In order to handle the important issues of data security, privacy, and interoperability in healthcare systems, this research article suggests a blockchain-based architecture for handling Electronic Health Records (EHRs). Fragmentation, security breach risk, and limited patient control over personal health data define the present EHR architecture. This paper looks at how blockchain technology may provide patient-centric access control and offer a distributed, unchangeable, transparent answer for EHR administration. By means of thorough investigation of both primary and secondary data, this study shows that blockchain implementations may considerably lower data breaches by 67%, increase interoperability among healthcare providers by 78%, and raise patient satisfaction with data ownership by 84%. Smart contracts for automated access control, cryptographic methods for safe data storage, and consensus systems for verifying health record transactions comprise the suggested architecture. By building trust, increasing operational efficiency, and enabling patients with more control over their health information, the results imply that blockchain-based EHR systems may transform healthcare data management.

Keywords

Blockchain, Electronic Health Records (EHR), Healthcare Data Security, Interoperability, Smart Contracts, Patient Data Ownership, Decentralized Healthcare, Medical Data Privacy

Paper Id: A166

Federated Learning and Blockchain Integration For Privacy Protection in IOT

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Abstract

The rapid growth of the Internet of Things (IoT) has led to the deployment of numerous smart devices that continuously generate and exchange sensitive data across domains such as healthcare, smart cities, and industrial automation. Traditional centralized machine learning approaches require transferring raw data to cloud servers, which raises serious concerns regarding privacy, security, and data ownership. Federated Learning (FL) provides a privacy-preserving solution by enabling distributed IoT devices to collaboratively train machine learning models while keeping data locally on devices and sharing only model updates. However, federated learning systems still face challenges such as lack of trust, vulnerability to malicious updates, and insecure coordination among participating devices. To address these limitations, this paper proposes the integration of blockchain technology with federated learning to provide a decentralized, secure, and transparent framework for IoT environments. Blockchain ensures the integrity and traceability of model updates through immutable records, while smart contracts enable secure authentication, access control, and automated aggregation without relying on a central authority. The proposed framework enhances data privacy, security, and trust among IoT devices, making it suitable for sensitive applications such as healthcare monitoring, smart grids, and industrial automation.

Keywords: Internet of Things, Federated Learning, Blockchain, Privacy Protection, Machine Learning, Smart Contracts, Data Security.

Paper Id: A167

Customer Satisfaction in App-Based Ride-Hailing Services: The Study of Hedonic and Economic Value

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Abstract:

The growth of application-based ride-hailing service has changed the nature of urban transportation by offering the option of convenient booking, flexible prices, and easy access via mobile apps. Mobility Services like Ola, Uber and Rapido are used widely in Chennai, but the customers sometimes experience problems like fluctuation in prices, cancellation of the drivers, and long wait times. This paper explores customer satisfaction in ride-hailing services that use the application process and the impact of hedonic and economic values in customer satisfaction and continuance intention. Hedonic value refers to the enjoyment, comfort and convenience involved in the ride whereas the economic value refers to the value and affordability. A sample of 325 respondents was used to collect primary data through a structured questionnaire; the data was then analysed through the use of statistical procedures, including reliability test, correlation, regression, ANOVA, chi-square test, and independent-sample t-tests. The results show that hedonic and economic value have a great impact on customer satisfaction. A high degree of satisfaction prompts the users to keep using ride-hailing apps. The paper emphasizes that the provision of a comfortable travel experience along with reasonable pricing are key elements in improving customer satisfaction and guaranteeing continued access to ride-hailing services.

Keywords: Ride-hailing services, Hedonic value, Economic value, Urban mobility.

Paper Id: A168

Analysis of Sequence Alignment and Similarity Searching in Bioinformatics

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Abstract

Sequence alignment is a fundamental and vital approach in bioinformatics for analyzing similarities between two or more biological sequences. By grouping sequences of DNA, RNA, or protein, researchers can identify patterns that reflect functional, structural, or evolutionary relationships. In a standard alignment matrix, rows represent individual sequences of nucleotides or amino acids. Gaps are strategically inserted to ensure that identical or chemically similar residues are aligned in the same columns. The Smith-Waterman algorithm is a well-known method for local sequence alignment, particularly in DNA analysis. Like many computational techniques, however, its efficiency is limited by the system's memory and computational capacity. This research paper aims to evaluate the Smith-Waterman algorithm's performance in generating scoring matrices and identifying significant matches using dynamic programming.

Keywords: Sequence Alignment, Similarity Searching, DNA, Bioinformatics.

Paper Id: A169

AI-Driven Deepfake Detection And Media Authentication Platform

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Abstract

The rapid growth of digital media and artificial intelligence, fake or manipulated content such as deepfakes is becoming more common on the internet. These fake images, videos, and audio files can spread misinformation and reduce people's trust in digital media. This project presents an AI-based Deepfake Detection and Media Authentication Platform that helps verify whether digital media content is real or manipulated. The system allows users to upload images, videos, or audio files through a simple interface. Once the media is uploaded, the system processes and analyzes it to detect possible signs of manipulation. It uses deep learning techniques, especially Convolutional Neural Networks (CNN), to examine facial features, pixel patterns, and lighting differences in images and videos. For audio files, the system analyses sound patterns to identify unnatural or synthetic voices. After the analysis, the system generates an authenticity report showing whether the media is real or fake along with detection results. This platform helps users easily verify digital content and reduces the spread of misleading media. Overall, the proposed system improves trust in digital information and can be useful in areas such as social media monitoring, journalism, cybercrime investigation, and digital forensics.

Keywords: Deepfake Detection, Media Authentication, Convolutional Neural Networks

Paper Id: A170

A Graph Neural Network Approach for Predicting Hamiltonian Path Feasibility in Genome Assembly

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Abstract

Genome assembly aims to reconstruct complete genome sequences from short DNA sequencing reads and is a fundamental problem in bioinformatics. This process is often represented using overlap graphs, where nodes correspond to sequencing reads and edges represent overlaps between them. Identifying a Hamiltonian path in such graphs is computationally challenging because the problem is NP-complete, especially for large genomic datasets. This paper explores the use of Graph Neural Networks (GNNs) to predict the feasibility of Hamiltonian paths in genome assembly graphs. In this study, three graph neural network architectures—Graph Convolutional Networks (GCN), GraphSAGE, and Graph Attention Networks (GAT)—are evaluated for learning structural patterns in assembly graphs. A dataset of synthetic genome assembly graphs was generated to simulate different levels of assembly complexity, and the models were trained to classify whether a Hamiltonian path exists in the graph. Experimental results indicate that graph neural network models outperform traditional machine learning methods in capturing structural relationships within graph data. Among the evaluated architectures, the Graph Attention Network achieved the best performance due to its ability to assign importance weights to neighboring nodes. The results suggest that graph-based deep learning techniques can assist genome assembly algorithms by reducing the search space for Hamiltonian path discovery and improving computational efficiency in genome reconstruction.

Keywords: Keywords: Genome Assembly, Graph Neural Networks, Hamiltonian Path, Bioinformatics, Machine Learning

Paper Id: A171

AWAKE WHEEL SMART SYSTEMS FOR PROACTIVE DRIVER DROWSINESS

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Abstract

Driver drowsiness detection has emerged as a crucial area in intelligent transportation systems, aiming to reduce the increasing number of road accidents caused by fatigue and lack of alertness. With the rapid advancement of computer vision, machine learning, and real-time monitoring technologies, intelligent systems can now analyse driver behaviour and provide timely warnings to enhance safety. This project presents a comprehensive approach for detecting driver drowsiness using facial feature analysis and machine learning techniques. The system utilizes a camera to capture live video and applies facial landmark detection to monitor key regions such as the eyes, mouth, and head position. It incorporates parameters such as Eye Aspect Ratio (EAR) to detect eye closure, mouth aspect ratio to identify yawning, and head posture analysis to recognize abnormal movements such as nodding.

Furthermore, the proposed system integrates multiple detection parameters to improve accuracy and reliability compared to traditional single-factor methods. An alert mechanism is implemented to notify the driver through sound and a voice-based chatbot to maintain alertness and engagement. Additionally, the system records driver activity metrics such as blink rate and alert frequency for performance evaluation. The study also highlights the system architecture, implementation methodology, key advantages, existing challenges, and future enhancements in AI-based driver monitoring systems, contributing to safer and more intelligent transportation environments.

Keywords: Driver Drowsiness Detection, Machine Learning, Computer Vision, Facial Landmark Detection, Eye Aspect Ratio (EAR), Artificial Intelligence.

Paper ID: A172

AI-Driven Automated Question Paper Generation System Using Bloom's Taxonomy and AI-Assisted Rephrasing

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Abstract

Designing examination question papers manually is a repetitive and time-consuming process for educators. Maintaining proper distribution of syllabus units, cognitive difficulty levels, and question formats often requires careful planning and manual validation. This paper presents an AI-driven Automated Question Paper Generation System aligned with Bloom's Revised Taxonomy to assist educators in generating structured and syllabus-aligned examination papers. The proposed system enables faculty members to upload a question bank and exam template, automatically analyze question distribution, configure exam structure, and generate balanced question papers across multiple units and cognitive levels. The framework supports various question formats such as multiple-choice questions (MCQ), short-answer questions, and long descriptive questions with flexible exam configurations including either-or and split question patterns. The system integrates Natural Language Processing techniques and optional AI-based question rephrasing using multiple providers such as OpenAI, Gemini, and Claude, along with an offline NLP engine. The generated examination paper can be previewed and exported as a formatted DOCX document following institutional exam standards. Experimental evaluation demonstrates that the system successfully ensures syllabus coverage, cognitive level distribution, and question diversity while significantly reducing faculty workload. The proposed approach offers a scalable intelligent solution for automated examination generation aligned with Outcome-Based Education and Bloom's taxonomy-based assessment frameworks.

Keywords: Automated Question Generation, Bloom's Taxonomy, AI-Based Education, NLP, Assessment Automation, Question Paper Generator, Educational Technology

Paper Id: A173

Impact of Training and Development on Safety Compliance among Coal Mine Workers: A Systematic Literature Review with Special Reference to Central Coalfields Limited, Jharkhand (2010–2025)

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Abstract

This work looks into how training shapes safety habits of coal miners, focusing on Central Coalfields Limited in Jharkhand by reviewing past studies. Its goal? To go through earlier findings about mining safety education while checking whether such efforts actually change worker actions around rules. Instead of just listing results, it digs into what gets in the way of good training rollouts across mines. Alongside obstacles, it surfaces practical approaches already working well within similar setups. Looking closely at past research, this work follows a clear step laid out in the PRISMA guideline to stay consistent and trustworthy. From sources like Google Scholar, Scopus, and Web of Science, plus official documents from ILO, DGMS, and Coal India Ltd., writings between 2010 and 2025 were gathered. Though many pieces appeared, only 45 met the conditions needed to be part of the deep look. Instead of just counting them, each one got studied to spot patterns around how training is run, whether rules are followed, and what gets in the way of learning in mines. Looking at the results, it becomes clear that organized training links closely to better safety rule following in coal miners. Because of programs like onboarding sessions, repeat workshops, hands-on skill building, along with hazard education efforts, employees gain clearer insight into risks tied to their jobs while picking up ways to stick to protocols. With consistent real-world practice, people tend to wear safety gear more often, stick to established routines, plus speak up when they spot danger or almost-accidents. Over time, these learning experiences cut down injury rates and gently shape how teams think about prevention before problems arise. Still, some nations now train miners using simulated tasks, VR headsets, alongside web-powered safety drills - ways that hold attention better, help people remember more. Yet across India's mining zones, tools like these show up rarely, blocked by poor connectivity and too few working devices. Workers here often cannot read well, speak different tongues at times, while day-hired staff sometimes miss out on sessions completely. The research shows training helps workers follow safety rules better in coal mines. Because of this, companies see fewer injuries on the job. Central Coalfields Limited, operating in Jharkhand, could gain real benefits by focusing on regular learning opportunities for staff. When people understand risks clearly, they act more carefully each day. Over time, consistent education builds habits that last across teams. Safety stops being just policy - it becomes part of how work gets done. Through wider involvement in workshops and drills, trust grows between employees and management. What results is not just lower accident numbers but stronger daily practices. Learning together shapes mindset shifts nobody plans, yet everyone notices. In remote mining areas, these changes matter even more than expected. Keywords: Systematic Literature Review, Training and Development, Safety Compliance, Occupational Health and Safety, Coal Mine Workers, Central Coalfields Ltd Jharkhand.

Paper Id: A174

DESIGN AND PERFORMANCE ANALYSIS OF AN ELECTRIC MOTOR OPERATED FOUR BLADE CHAFF CUTTER

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Abstract:

The project aims to develop an efficient machine for cutting green and dry fodder for livestock. The system uses a 3 HP electric motor to rotate a shaft fitted with four sharp blades that chop fodder into uniform pieces. The design helps to reduce manual labor, increase cutting efficiency and improve fodder preparation for farmers. Performance analysis of the machine is carried out based on parameters such as cutting capacity, power consumption, blade speed and cutting efficiency. The results show that the fabricated chaff cutter operates effectively with a cutting capacity of about 900–1000 kg per hour, blade speed of around 900–1200 rpm and power consumption of about 3kW. The machine produces fodder pieces of 15–30 mm length with a cutting efficiency of about 80–90%, indicating that it is suitable for small and medium-scale farms with reduced labor and improved productivity.

Keywords: Chaff Cutter, Four-Blade System, Electric Operation, Cutting Efficiency.

Paper Id: A175

An Efficient Optimizer for Dynamic Graph Neural Network with Imbalanced Dataset

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Abstract

This paper proposes a graph neural network framework that model imbalanced dataset into a graph and detect structural irregularities, to incorporate temporal patterns for link prediction and address challenges like heterophily, class imbalance, and explainability. The performance of the model underlines its potential as an effective tool for detecting fraud in transaction networks and disease detection in social networks, showcasing its ability to adapt to the dynamic and complex nature of systems. We also experimented with various graph embedding modules within the framework and find the effectiveness of each module. In conclusion, it is possible to achieve good performance in the detection task. Our framework shows the best configuration that achieves state-of-the-art performance on several prediction tasks for dynamic graphs.

Keywords: Graph Neural Network, Heterophily, Class imbalance, Explainability.

Paper Id: A176

Neurosymbolic AI: A Hybrid Approach to Explainable and Reasoning-Based Artificial Intelligence

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Abstract:

Artificial Intelligence has advanced rapidly through deep learning, achieving strong results in vision, language, and speech tasks. However, these neural approaches remain largely opaque, data-hungry, and limited in structured reasoning. Symbolic AI, by contrast, offers logical transparency but cannot learn from complex data. Neurosymbolic AI (NSAI) emerges as a hybrid paradigm combining the learning capacity of neural networks with the reasoning and interpretability of symbolic systems. Our work reviews the conceptual foundations of NSAI, compares the three principal AI paradigms, examines core hybrid architectures, and evaluates NSAI applications across healthcare, autonomous systems, natural language processing, and military decision support. Our work further identifies open challenges and future research directions. NSAI represents the most credible current pathway toward AI systems that are simultaneously capable, explainable, and logically grounded.

Keywords: Neurosymbolic AI, Symbolic Reasoning, Explainable AI, Hybrid AI Systems, Knowledge Representation

Paper Id: A177

**SMART FIRE DETECTION USING ARTIFICIAL
INTELLIGENCE FOR EARLY WARNING AND REAL-TIME
SAFETY MONITORING**

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Abstract :-

.... Fire and smoke detection is a critical task in ensuring public safety and minimizing damage to life, property, and the environment. Traditional detection systems that rely on temperature and smoke sensors often suffer from slow response times, limited coverage, and high maintenance costs, making them less effective for large or outdoor environments. To overcome these limitations, this project introduces a real-time fire and smoke detection system that leverages image processing and deep learning techniques to identify fire and smoke accurately and efficiently. The proposed system performs background subtraction to isolate moving regions, followed by color-based analysis in RGB and HSV spaces to identify potential fire and smoke areas. Feature extraction techniques are then applied to distinguish these regions from other visually similar objects. By integrating the YOLO (You Only Look Once) algorithm, the model ensures precise and rapid classification, enabling real-time monitoring and immediate response. The system further incorporates an intelligent alert mechanism that notifies users through alarms and message notifications upon detecting fire or smoke. Through real-time video processing and optimized neural network training, the model achieves high accuracy while minimizing false alarms and computational complexity. This combination of image processing and deep learning results in a system that is both fast and reliable, suitable for deployment in residential, industrial, and public environments. Experimental results demonstrate that the proposed approach significantly outperforms traditional sensor-based systems in terms of detection speed, accuracy, and operational efficiency, making it a promising solution for early fire and smoke detection across various settings..

Keywords: Machine Learning, Deep Learning, YOLO, CNN, KNN

Paper Id: A178

DRILLING CHARACTERISTICS EVALUATION AND OPTIMIZATION OF HYBRID AMMC WITH VARIOUS END POINT ANGLE

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ABSTRACT

Metal cutting is essential for achieving high material removal rates and superior product quality, but tool life remains a major limitation. In this study, machining characteristics and geometrical properties of AA2618 alloy reinforced with Tungsten Carbide (3%), Silicon Carbide (3%), Cenosphere (3%), and Graphite (1%) were optimized using Taguchi Design (L16 array) and ANOVA. After sand casting, specimens were drilled on a CNC machine under varying parameters such as spindle speed, feed rate, end point angle, and pecking strategy. The results revealed that minimum surface roughness occurred when all parameters were set at lower levels, while the lowest diameter error was achieved at low spindle speed, medium feed rate, pecking strategy, and a 75° end point angle. Notably, reducing the end point angle of the drill bit enhanced both surface finish and geometrical precision.

Keywords - AMMC, Drilling, Ra, CMM, DOE, Tungsten carbide, SiC

Paper Id: A179

AI Based Digital Minimalism System

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ABSTRACT

The AI-Based Digital Minimalism System is designed to help individuals reduce smartphone addiction and develop healthier digital habits. In today's digital world, excessive smartphone usage has become a common problem that affects productivity, mental health, and daily routines. This system uses Artificial Intelligence and Machine Learning techniques to monitor and analyze smartphone usage patterns. It collects data such as screen time, frequency of app usage, and time spent on different activities to understand user behavior. By analyzing this data, the system can identify addiction patterns and detect when smartphone usage becomes excessive or unhealthy. The system provides personalized feedback and recommendations to encourage users to practice digital minimalism. It may send alerts, reminders, or suggestions to limit screen time, schedule breaks, and focus on more productive tasks. Additionally, the system can track user progress over time and motivate them to maintain balanced technology usage. By promoting awareness and self-control, the AI-based system helps users build healthier relationships with their devices.

Ultimately, this solution aims to improve productivity, mental well-being, and overall lifestyle by reducing dependency on smartphones and encouraging mindful technology usage.

Keywords—Digital Minimalism, Smartphone Addiction, Artificial Intelligence, Machine Learning

PAPER ID: A180

DETECTING & ANALYZING SOCIAL MEDIA SPAM COMMENTS

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ABSTRACT

The rapid growth of online communication has led to a large increase in user-generated comments. While many comments are useful and meaningful, a significant number contain spam content such as unwanted advertisements, promotional messages, fake links, or misleading information. These spam comments reduce the quality of discussions and may expose users to harmful or fraudulent content. As the number of comments increases daily, manually monitoring and filtering spam becomes difficult and time-consuming. Therefore, an automated system is required to detect and analyze spam comments efficiently. This project focuses on identifying spam comments using data mining and text processing techniques. The system collects a dataset of comments and processes the raw text through several preprocessing steps such as cleaning the text, removing unnecessary symbols, eliminating common stop words, and tokenizing the sentences. These steps help prepare the data for accurate analysis. After preprocessing, feature extraction techniques are used to identify important keywords and patterns commonly found in spam comments. Based on these patterns, a classification model is trained to distinguish between spam and genuine comments. The trained model can automatically classify new comments as spam or non-spam. This system helps reduce manual monitoring, improves the quality of discussions, and creates a safer and more reliable online communication environment.

Keywords — Spam Detection, Data Mining, Text Classification, Comment Analysis

Paper Id: A181

COMPARATIVE TIME SERIES MODELLING AIR QUALITY INDEX FORECASTING IN DELHI USING STATISTICAL, MACHINE LEARNING, AND BAYESIAN APPROACHES

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Abstract

Air pollution is a persistent environmental and public health challenge in megacities, with Delhi consistently ranking among the most polluted urban regions globally. Accurate forecasting of the Air Quality Index (AQI) is essential for early warning systems, policy formulation, and sustainable urban planning. This study presents a comprehensive comparative framework for forecasting monthly AQI in Delhi, India, using a combination of classical statistical, machine learning, and Bayesian time-series models. Monthly AQI data obtained from the Central Pollution Control Board (CPCB) are analyzed to capture seasonal patterns, long-term trends, and nonlinear dynamics inherent in urban air pollution. The proposed framework integrates Seasonal Autoregressive Integrated Moving Average (SARIMA), Bayesian Structural Time Series (BSTS), Long Short-Term Memory (LSTM) networks, and Bayesian regression-based forecasting models. Time-series cross-validation with a rolling-origin evaluation strategy is employed to ensure robust and unbiased performance assessment. In addition to point forecasts, the study emphasizes uncertainty quantification through Bayesian credible intervals, enabling probabilistic interpretation of AQI predictions. Model performance is evaluated using multiple error metrics, including RMSE, MAE, MAPE, and probabilistic scores. The results highlight the strengths and limitations of each modelling approach in capturing Delhi's complex pollution dynamics, particularly during severe seasonal episodes such as winter smog. The findings demonstrate that hybrid consideration of statistical rigor, nonlinear learning capability, and uncertainty estimation provides a reliable and policy-relevant forecasting framework for urban air quality management.

Keywords: Air Quality Index, Delhi Air Pollution, SARIMA, Bayesian Structural Time Series, LSTM, Bayesian Forecasting, Time-Series Cross-Validation, Urban Environment.

PAPER ID: A182

IMPACT OF ESG DISCLOSURE IN ENHANCING CORPORATE TRANSPARENCY AND INVESTOR TRUST: A GLOBAL PERSPECTIVE

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Abstract

ESG reporting has become increasingly important. This is because organizations across the globe are mandated to offer information on their environmental impact, treatment of people, and decision-making processes. This information is needed by investors the government, and other stakeholders to establish whether organizations are running their operations in a sustainable and ethical way. As a result, organizations are mandated to be transparent and honest about their ESG reports. This paper examines the importance of ESG reporting in enhancing transparency and confidence among investors. Organizations are now mandated to offer separate reports on their environmental impact or incorporate ESG information into their annual reports. However, the information offered by these organizations is not equal. While some organizations offer comprehensive information on ESG, others offer very minimal information, which has a negative impact on investor confidence in their long-term responsibility and stability. This empirical research examines how ESG reporting by organizations improves the reputation of the company and increase investor confidence, by focussing attention on transparency and honesty besides internal organisational constructs and external pressure constructs which help investors make in informed decisions. The findings reveal that companies that are open about their environmental and social effects are likely to gain the confidence of the investors. It also highlights the importance of having a set of guidelines for ESG reporting and the need for regulatory support to make ESG reporting more reliable. The results help in concluding that ESG disclosure is important for companies which in turn helps investors make informed decisions.

Keywords: ESG disclosure, corporate transparency, investor trust, sustainability reporting, corporate governance, responsible investment

PAPER ID: A183

IMPACT OF ARTIFICIAL INTELLIGENCE ON EMPLOYEE ENGAGEMENT AND PRODUCTIVITY AT AFTEC GLOBAL SOLUTIONS

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Abstract

Recent technological developments have encouraged many organizations to introduce Artificial Intelligence (AI) into their daily operations. AI applications are increasingly used to support employees, simplify work processes, and improve overall efficiency. This study investigates how the use of AI systems influences employee engagement and productivity at Aftec Global Solutions. The research particularly focuses on understanding whether AI-supported tools affect employees' enthusiasm for their work, their level of involvement in job tasks, and their ability to complete work effectively. The study also considers employees' perspectives on AI and the role played by organizational support in helping staff adapt to technological changes. Data for the study were collected from employees through a structured survey. The questionnaire included background information about respondents as well as statements related to AI usage, work engagement, and productivity levels. The responses were examined using statistical techniques such as descriptive analysis and correlation analysis to explore possible relationships between AI adoption and employee performance. The results indicate that AI systems assist employees by reducing repetitive work and improving task accuracy. As a result, employees are able to dedicate more attention to important and skill-based activities. The study suggests that when organizations provide appropriate guidance and training, the use of AI can support higher engagement and improved productivity among employees.

Keywords: AI Adoption, Employee Performance, Productivity, AI Automation, Organizational Support.

PAPER ID: A184

TEA: A MULTI-STAGE PIPELINE FOR AUTOMATED EVALUATION OF HANDWRITTEN ACADEMIC SCRIPTS

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Abstract

Manual grading of handwritten scripts is slow and prone to subjective variance, yet automated OMR systems remain largely restricted to objective-type assessments. This paper details TEA (Text Extraction and Evaluation with Agreement Analysis), a modular pipeline architected to bridge the gap between digitized Handwriting Text Recognition (HTR) and automated pedagogical assessment. TEA was developed through three incremental cycles, evolving from MCQ extraction using Tesseract and EasyOCR to multi-line descriptive answer evaluation via PaddleOCR. The technical core consists of a hybrid scoring logic that merges keyword density analysis (leveraging spaCy noun chunks) with transformer-based semantic vectorization. This dual-path approach ensures that responses are evaluated for both technical terminology and conceptual intent. To validate system reliability, we implemented a meta-layer of Agreement Analysis using the Simple Matching Coefficient (SMC) to benchmark machine scores against human expert grading. Evaluations indicate that while HTR latency remains a primary constraint, the hybrid evaluation logic provides a transparent and reliable framework for automating descriptive answer assessment in academic settings.

Paper Id: A185

Analysis of Pipeline Connected Loads on Nozzles Welded to Air Receiver Drum Using WRC 107, 297, 537 and ASME Codes.

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Abstract

This study presents a comprehensive analysis of pipeline connected loads acting on nozzles welded to an air receiver drum, focusing on the comparative performance of WRC 107, WRC 297, and WRC 537 methodologies under ASME Section VIII code compliance. Conventional design practices often underestimate external piping loads, leading to localized stress concentrations that compromise safety and reliability. To address this, shell and head thicknesses were calculated using UG-27 and UG-32, while nozzle reinforcement adequacy was validated through UG-37/UG-40 protocols. A dual-validation framework was employed, combining manual calculations based on empirical WRC charts with PV Elite simulations to ensure convergence with code requirements. The methodology extended beyond numerical checks, incorporating piping flexibility, reinforcement pad design, and sensitivity analysis of load variations to establish a reproducible workflow applicable across diverse vessel geometries. By systematically comparing the three WRC approaches, the study highlights the conservative nature of WRC 297, the refined accuracy of WRC 537 through modern correction factors, and the limitations of legacy WRC 107 under complex loading conditions. This work bridges the gap between empirical methods and computational tools, offering engineers a structured, code-compliant procedure for nozzle junction evaluation that enhances predictive reliability, supports safer vessel design, and provides a validated methodology for adoption in contemporary design workflows to improve reproducibility and reliability in pressure vessel engineering.

Paper Id: A186

Early Detection of Cardiac Arrest in Newborn Babies

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Abstract

In neonatal intensive care units (NICUs), identifying infant cardiac arrest as soon as possible is one of the main challenges. If not treated promptly, cardiac arrest is a sudden, dangerous event that can result in major complications or even death. In a Cardiac Intensive Care Unit (CICU), medical staff must tend to numerous infants at once, which can be challenging to manually monitor and diagnose and may result in delays. One innovative and successful approach to addressing these issues is the integration of machine learning into clinical decision support systems. Real-time physiological data can be used to train machine learning algorithms to identify anomalous patterns and anticipate impending cardiac events. This study presents a machine-learning-based method for detecting early indicators of infant cardiac arrest. The system uses artificial intelligence and statistical techniques to assess vital signs such as blood pressure, heart rate, respiration rate, and oxygen saturation. Principal Component Analysis (PCA) is used to refine the data by reducing its dimensionality and minimizing noise. The likelihood of a cardiac event is then evaluated by training classifiers such as Support Vector Machines (SVM) and Artificial Neural Networks (ANN)

Paper Id: A187

Smart Home Automation using ESP32 with Hybrid Connectivity and Energy Monitoring

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Abstract

This paper introduces an advanced Smart Home Automation System based on the ESP32 microcontroller, aimed at improving convenience, reliability, and energy efficiency in modern homes. Unlike traditional systems that depend solely on internet connectivity, this design employs a hybrid communication model using both Wi-Fi and Bluetooth, ensuring continuous operation even during network outages. Users can remotely control and monitor appliances such as lights, fans, and other electrical devices via a mobile application. The system features real-time energy monitoring to track power consumption of individual devices, enabling users to optimize usage and lower electricity costs. Additionally, smart alerts detect abnormal conditions like overloads or device malfunctions, enhancing overall safety. The ESP32 serves as the central controller, interfacing with relay modules and sensors to automate device operations based on user commands and environmental factors. This solution is cost-effective, scalable, and easy to deploy, making it suitable for smart homes, offices, and small-scale industrial applications. The integration of hybrid connectivity and intelligent monitoring significantly boosts the system's performance and reliability.

Keywords: ESP32, IoT, Smart Home, Automation, Energy Monitoring, Hybrid Connectivity

Paper Id: A188

Virtual Reality Based Simulation for CBRN Emergency Response Training: A Chernobyl Disaster Case Study

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Abstract

Traditional Chemical, Biological, Radiological, and Nuclear (CBRN) emergency response training is severely constrained by high logistical costs, extreme safety risks, and the inability to realistically replicate large-scale disaster environments like the Chernobyl nuclear disaster. This paper presents a high-fidelity Virtual Reality (VR) simulation platform designed to bridge these critical gaps in emergency responder training. Utilizing the Unity game engine and Meta Quest 3 hardware, the system features a 1:1 scale, historically accurate 3D reconstruction of the Chernobyl Reactor 4 control room. The simulation integrates real-time radiation physics, spatial audio, and interactive functional equipment to immerse trainees in a high-stress, hazardous environment without physical danger. Furthermore, the platform incorporates a backend analytics engine to quantitatively evaluate trainee performance by tracking response latency, standard operating procedure (SOP) accuracy, and cumulative simulated radiation exposure. The results demonstrate a significant improvement in spatial awareness and procedural retention over traditional manual-based learning. This study highlights the technical architecture, deployment strategies, and the transformative potential of immersive VR systems as a safe, cost-effective, and highly repeatable paradigm for specialized disaster response units.

Keywords: Virtual Reality, CBRN Training, Immersive Simulation, Unity 3D, Disaster Management.

Paper ID : A189

ANALYSIS AND IDENTIFICATION OF MALICIOUS MOBILE APPLICATIONS USING OSINT AND THREAT INTELLIGENCE

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Abstract

The rapid growth of Android applications increased security concerns related to malware, privacy leakage, and insecure mobile environments. Mobile application security analysis therefore became an important research area in cybersecurity. Many existing tools relied mainly on limited static analysis or isolated threat databases, which reduced the effectiveness of detecting emerging mobile threats. These limitations created the need for a more comprehensive system that integrates intelligence-driven techniques for improved application risk assessment.

The objective of this study involved the development of a mobile application security analysis platform capable of identifying potential security threats in Android applications. The problem addressed included detecting malicious application behavior, excessive permission usage, and suspicious network indicators. The system architecture consisted of a backend service, a web-based user interface, and a machine learning analysis module deployed using container-based infrastructure. The methodology included static application package analysis, permission risk evaluation, network indicator verification, and correlation with trusted threat intelligence sources. Machine learning techniques analyzed permission patterns and intelligence signals to classify applications into different security risk categories.

The analysis process identified dangerous permission combinations, suspicious domain and internet protocol indicators, and abnormal application characteristics associated with mobile threats. Integration of intelligence sources improved the effectiveness of identifying malicious indicators. The results highlighted the value of combining intelligence-driven analysis and machine learning for strengthening mobile application security assessment and supporting secure application vetting.

Keywords : Mobile Security, Android Application Analysis, Threat Intelligence, Machine Learning, Malware Detection, Risk Assessment.

Paper Id:A190

Solar Power for Rural Electrification

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Abstract:

Access to reliable electricity remains a major challenge in many rural areas, especially in developing regions. Conventional grid extension is often expensive and difficult due to geographical and economic constraints. Solar power offers a sustainable and cost-effective solution for rural electrification by utilizing abundant sunlight to generate electricity. This paper focuses on the use of solar photovoltaic (PV) systems to provide power for basic needs such as lighting, irrigation, and small-scale industries in rural communities. It discusses the working principle of solar panels, system components like batteries and inverters, and the overall implementation of standalone and hybrid solar systems. The study also highlights the advantages of solar energy, including low maintenance, environmental friendliness, and reduced dependence on fossil fuels. Challenges such as initial installation cost and energy storage limitations are also addressed. Overall, solar power plays a vital role in improving the quality of life and supporting sustainable development in rural areas.

Keywords: Solar Energy, Rural Electrification, Photovoltaic (PV) System, Renewable Energy, Sustainable Development, Off-grid System, Energy Access, Solar Power Generation

Paper Id: A191

Design of an FPGA-Based Customized RISC-V SoC for Crypto Acceleration

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Abstract

The increasing demand for secure and efficient data processing in IoT and embedded systems has highlighted the limitations of software-based cryptographic implementations, which suffer from high latency, excessive power consumption, and poor throughput on resource-constrained devices. This paper presents the design of an FPGA-based customized RISC-V System-on-Chip (SoC) integrated with a dedicated hardware Crypto Accelerator Engine to address these challenges. The proposed architecture incorporates a RISC-V RV32IMC processor core coupled with a hardware accelerator supporting AES-128/256 encryption and SHA-256 hashing, interfaced through a memory-mapped bus. Implemented on an ZedBoard FPGA, the design achieves significantly higher throughput and lower power consumption compared to equivalent software implementations. The system is validated using NIST standard test vectors, confirming functional correctness. Results demonstrate the effectiveness of the proposed SoC as a scalable, open-source solution for hardware-accelerated cryptography in secure edge computing applications.

Keywords: FPGA, RISC-V, SoC, Crypto Accelerator, AES, SHA-256, IoT Security, Hardware Acceleration.

Paper Id: A192

Smart EV Charging System with Renewable Energy Support

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Abstract

The increasing use of electric vehicles (EVs) demands an efficient and eco-friendly charging system. This paper proposes a simple and cost-effective Smart EV Charging System powered primarily by solar energy. The system integrates solar panels, a battery storage unit, and grid supply to ensure continuous and reliable charging. During daytime, solar energy is used as the main power source for charging EVs, while excess energy is stored in the battery. When solar energy is unavailable, the system automatically switches to battery power, and if required, to grid supply. A basic smart controller is implemented to manage energy flow between these sources, ensuring optimal utilization and reducing energy wastage. The system also includes a user interface to monitor charging status and energy usage. This solution reduces dependency on conventional electricity, lowers charging costs, and minimizes carbon emissions. Its simple design makes it suitable for residential and small-scale public charging stations. Overall, the proposed system provides an efficient, affordable, and sustainable solution for EV charging infrastructure, supporting the transition toward green energy and smart transportation.

Keywords: Electric Vehicles, Renewable Energy, Solar Energy, Smart Charging, Battery Storage

Paper Id: A193

Multilingual Video Dubbing System

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ABSTRACT

India's rich linguistic diversity presents a major challenge in delivering educational, informational, and awareness-based video content to a broad audience, as most digital media is predominantly produced in English, limiting accessibility for non-English-speaking populations. Manual translation and dubbing into multiple regional languages is labor-intensive, time-consuming, and economically inefficient, especially when content needs to be distributed at scale. To address this issue, this project proposes a Multilingual Video Dubbing System that automates the process of translating and dubbing videos into multiple Indian regional languages using advanced artificial intelligence techniques. The system employs speech-to-text technology to accurately extract spoken content from the source video, followed by natural language processing-based translation models that convert the extracted text into target languages while preserving contextual meaning and semantic accuracy. To enhance understandability, the translated content is refined and simplified before being passed to neural text-to-speech engines, which generate natural-sounding voice outputs with appropriate tone and clarity. In parallel, synchronized subtitles are automatically generated to further support comprehension and accessibility. The system ensures proper alignment between audio, subtitles, and video frames, resulting in a seamless viewing experience. Designed to support both online and offline video processing, the solution is scalable and adaptable to various domains such as education, public awareness campaigns, e-learning platforms, and governmental communication. Experimental evaluation shows that the proposed system significantly reduces dubbing time and manual effort while maintaining high translation accuracy, intelligible speech synthesis, and effective synchronization.

Keywords— Multilingual Video Dubbing, Speech-to-Text, Natural Language Processing, Text-to-Speech, Indian Regional Languages, Subtitle Generation, Video Localization, Public Awareness, AI-based Multimedia Processing

Paper Id: A194

AI-Driven Mental Health Monitoring and Support system

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Abstract

Mental health issues such as stress, anxiety, and depression are rapidly increasing due to academic pressure, workplace challenges, and lifestyle changes. Early detection and continuous monitoring are essential to provide timely support and prevent serious psychological conditions. This paper presents an AI-Driven Mental Health Monitoring and Support System that uses artificial intelligence techniques to monitor and analyze users' emotional well-being. The system integrates machine learning, natural language processing, and behavioral data analysis to evaluate mental states through user inputs such as text responses, questionnaires, and interaction patterns. Based on this analysis, the system can detect signs of stress, anxiety, and depression.

The proposed system provides personalized recommendations, including relaxation techniques, motivational support, and mental wellness activities. It also acts as an early warning system by identifying potential mental health risks and encouraging users to seek professional help when needed. Designed as a user-friendly platform, it ensures privacy, accessibility, and continuous monitoring. Overall, the system promotes proactive mental healthcare and improves users' well-being.

Keywords: Artificial Intelligence, Mental Health Monitoring, Machine Learning, Natural Language Processing, Emotional Analysis, Stress Detection, Digital Mental Health Support, Predictive Analytics

Paper Id: A195

Early Prediction of Forest Blazes Using Classification and Regression Techniques

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Abstract

Forest Fires are very unplanned. Therefore, Wildfires could be predicted to stop after they have started and their destructive effects can be lessened. This paper suggests the best method for forecast of forest blazes using the ML algorithms Random Forest, Gradient Boosting, and Support Vector Regressor. In this method, all the three models are designed for the regression task, particularly to forecast the Fire Weather Index (FWI), depending upon environmental factors. The performance metrics consist of MSE, MAE, and RMSE. The focus of this study is to predict the frequency and intensity of fires with meteorological and environmental data. The method usually predicts the burned area based upon temperature, humidity, wind speed, and vegetation. It's supposed to help in giving precise and fast fire risk assessments in order to foster early warning systems, thus aiding better resource allocation and increase lessened damage. This study contributes to the understanding of machine learning potential in environmental risk management by demonstrating the success of ensemble methods and support vector machines in predicting forest fire progress.

Keywords—Forecasting Forest fire, Regression, Log transform, Relative humidity, Wind speed, Fire weather index, Burned area Environmental factors

Paper ID: A196

AN APPROACH TO FLASH LOANS ATTACK ROBUSTNESS IN DEFI PROTOCOLS

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Abstract

Market manipulation through attacks on share prices is often done for personal gain, resulting in the deception of other shareholders. Existing techniques, such as Time- Weighted Average Price (TWAP) and Chainlink, are constrained by external dependencies, whereas our methodology assesses the liquidity pool's depth. The dataset included in our analysis is the DefiLlama API dataset. We use the idea of utilisation ratio (U); if the ratio surpasses a specific threshold, it becomes nonlinear and may signify a flash loan, we introduce a buffer value that adjusts based on the 7-day average liquidity depth from your DefiLlama data. We test the 5400+ protocols from the dataset using the mathematical formula and classify them as critical, resilient or fragile.

Keywords: Network Robustness, Graph theory, Liquidity, Flash Loan, Oracle, ChainLink.

Paper Id: A197

GEN AI CONTENT GENERATION MODEL USING LLM WITHOUT INTERNET

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Abstract

The Gen AI content generation model uses the LLAMA-3.1-8B model where 8B implies 8 billion parameters to effectively produce customized content. It generates the content based on three inputs: topic, word count, and complexity level, which can be easy, medium, or hard. The front-end development is done by using Streamlit and CSS-based interface to make the model user-friendly. Backend functions are supported by Lang Chain and C Transformers modules for proper communication. It is totally an offline-working model that minimizes reliance on servers or even internet access in favor of increased security. This pre-training will have been extensive over datasets that try to uncover all patterns while the fine-tuning is toward applications in various tasks, thereby perfecting text summarization, question answering, content generation, or even classification tasks.

Keywords: LLAMA, CTransformers, Large Language Model, Natural Language Model, Deep Learning; LangChain, Streamlit; FineTuning.

Paper Id: A198

Intelligent Enterprise Assistant: An AI-Driven Chatbot for Secure and Scalable Organizational Support

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Abstract

Large public sector organizations handle a vast and continuous influx of employee queries related to Human Resources (HR) policies, IT support, and administrative procedures. Traditional support systems that rely on manual intervention frequently result in delayed responses, isolated information silos, and overburdened personnel. To address these inefficiencies, this project proposes an AI-driven Intelligent Enterprise Assistant that leverages Deep Learning and Natural Language Processing (NLP) techniques to automate and optimize employee support services. The proposed system acts as a centralized, real-time knowledge hub capable of accurately recognizing user intent and generating contextual responses across multiple organizational domains. Furthermore, the assistant introduces advanced document processing capabilities, enabling automated text extraction and summarization from unstructured user uploads. To ensure enterprise-grade reliability, the architecture integrates strict security protocols, including Two-Factor Authentication (2FA) via email verification and a dynamic bad-language filtering mechanism. Engineered for high scalability and low latency, the system guarantees response times under five seconds for multiple concurrent users. Ultimately, this intelligent chatbot framework significantly reduces manual administrative workloads, streamlines secure information access, and enhances overall operational efficiency.

Keywords: Natural Language Processing, Deep Learning, Enterprise Chatbot, Retrieval-Augmented Generation, Document Summarization, Process Automation.

Paper Id: A199

Vision Eye

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Abstract

Vision Eye is a real time eye detection system developed using computer vision and image processing techniques. The main purpose of this study is to design a simple yet efficient system that can act as human eyes from live camera feed or static images. The system captures a video and also acts as a video input through webcam and processes each frame to detect facial features with focus only on the eye region. To achieve this, the study uses Haar Cascade classifiers provided by OpenCV. The detection process begins by converting the captured image into grayscale, which helps to reduce computational complexity and improves detection speed. The system first identifies the face and then narrows down the search area to detect the eyes within the facial region. Basic noise reduction techniques are applied to maintain performance even when lighting conditions are not ideal. One of the biggest strengths of this is to ability to work in real time without requiring expensive hardware or complex configurations. This makes it practical for everyday applications such as driver drowsiness detection, biometric systems, human-computer interaction, and assistive technologies. The lightweight structure of the system ensures faster processing and smooth operation. During testing, the system showed consistent and reliable eye detection across different users and environments. During implementation we faced many challenges with lighting conditions, but we managed to overcome it with multiple tests, Although simple in design, it creates a strong foundation for further improvements. Future upgrades may include blink detection, gaze tracking, and emotion analysis features. Overall, Vision Eye demonstrates how computer vision can be applied in a practical and meaningful way. It highlights the potential of intelligent visual systems in enhancing safety, interaction, and automation in modern technology.

Keywords: Computer Vision, Eye Detection, Haar Cascade Classifier, OpenCV, Real-Time Image Processing, Facial Feature Detection

Paper Id: A200

ENHANCEMENT OF HEATING VALUE OF SUGARCANE BAGASSE AT DIFFERENT MOISTURE CONTENTS USING UNBURNT COAL BLENDING

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Abstract

Bagasse is a byproduct obtained from sugarcane after the extraction of sugar juice. It serves as an important fuel resource in sugar industries for the production of steam and power generation. Due to its fibrous structure, low density, wide range of particle sizes, and high moisture content, its combustion characteristics vary significantly. The heating value of bagasse is one of the most important properties influencing its performance as a biomass fuel. It is greatly affected by its moisture content, where a reduction in moisture enhances the calorific value. Furthermore, the addition of unburnt carbon to moisture-reduced bagasse improves its higher heating value. This enhancement leads to better combustion efficiency and improved plant performance in terms of steam generation and power production. As a result, a considerable amount of fuel can be conserved, contributing to increased overall efficiency of the system.

PAPER ID:A201

DESIGN AND IMPLEMENTATION OF ESCALATOR LAYOUT DEVELOPMENT FOR AN.INDUSTRY CASE STUDY

ABSTRACT

Escalator installations sometimes face non-standard site and customer requirements in large-scale infrastructure and industrial building projects; these are generally referred to as D-Option conditions. In order to guarantee both compliance and adaptability, these scenarios require engineering workflows that are both flexible and standardized. An industry-based case study on the design and automation of escalator layout development for TM210/220 models under such unusual circumstances is presented . The Tender and Order (T&O) system is used to methodically record customer-specific needs, which are then assessed by Frontline (FL) engineers to find deviations from conventional configurations. To ensure compliance with corporate engineering standards and structural safety rules, technical reference documents such as D01, FG02, FG15, and FG16 are downloaded from the Product Data Management (PDM) system. Reaction force calculations have historically been done by hand, which has resulted in longer engineering lead times, a greater chance of human mistake, and a reliance on specialized knowledge. An Excel-based automated reaction force calculation tool with cut-off values and rule-based logic generated from actual project order data was created in order to get around these restrictions. By combining several calculation sheets into a single dynamic framework, this automation makes it possible to validate load distribution, intermediate support placements, and span restrictions with little to no human involvement. AutoCAD software is used to create escalator layouts based on the calculated reactions. This program produces clear visual outputs of dimensions and support placements. Internal verification procedures and tender approval protocols are used to further confirm the layouts, guaranteeing traceability from client input to final design. The suggested approach greatly increases standardization across several escalator projects, decreases design cycle time, and improves calculation accuracy. Additionally, the Excel automation framework's modular design guarantees scalability, enabling future expansion to escalator models other than TM210/220. The system strikes a balance between flexibility and dependability by combining industry-standard compliance with customer-specific modification. All things considered, this case study shows how automation-driven layout development may simplify engineering procedures, lower mistake rates, and facilitate scale implementation in challenging industrial projects.

Keywords: Escalator Layout Design, D-Option, Reaction Force Calculation, Excel Automation, AutoCAD, Standardization, Scalability

Paper Id: A202

Analysing Behavioural Root Causes of Stress Using Machine Learning and Digital Data

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Abstract

Stress is a significant concern for many people today, especially with increased use of cell phones and social media. This project aimed to see if people's daily digital behaviours could be associated with their levels of stress. Data collected from users included age, gender, hours of sleep each night, screen time on a phone or computer, physical activity, diet, days and hours of social media activity, length of text or online posts, and other information. The data was cleaned before analysis, and missing values were imputed. New features were created along the way, such as the average amount of sleep on each night, the amount of late-night cell phone use, if physical activity levels varied on the weekend, and sentiment from each post (if any). In addition to sleep, social media use appeared to coincide with levels of stress with more scrolling each late night occurring in users that ambivalently indicated higher stress levels. Several machine learning models, namely Random Forest, Extreme Gradient Boosting (XGBoost), and Support Vector Machine (SVM), were evaluated to predict stress levels as low, medium, or high. The evaluation metrics included accuracy and F1-scores. The models identified sleep quality, weekend behaviour, and social media activity as the most helpful features. In summary, this study shows that simple daily digital footprints can provide useful evidence about stress. In addition, monitoring everyday behaviours might allow people to pick-up on high stress before it becomes a bigger problem, allowing them to take action on sleep or screen time, for instance.

Keywords: Machine Learning, Stress Prediction, Digital Behaviour Analysis, Social Media Usage, Random Forest

Paper Id: A203

Role of Artificial Intelligence in Strategic Decision Making

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Abstract

Artificial Intelligence (AI) is increasingly transforming the way organizations make strategic decisions in today's dynamic and data-driven business environment. Traditional decision-making processes often rely on limited data and human judgment, which may result in slower and less accurate outcomes. AI technologies such as machine learning, data analytics, and predictive modeling enable organizations to process large volumes of data, identify patterns, and generate valuable insights for strategic planning.

AI supports managers in analyzing market trends, customer behavior, and competitive environments, thereby improving the quality and speed of decision-making. It also helps organizations forecast future trends, evaluate alternative strategies, and reduce uncertainty in complex business situations. Through AI-based decision support systems, organizations can enhance operational efficiency, improve resource allocation, and strengthen their competitive advantage.

However, the adoption of AI in strategic decision-making also presents challenges such as data privacy issues, high implementation costs, and the requirement for skilled professionals. Therefore, organizations must integrate AI capabilities with human expertise and ethical considerations to achieve effective strategic outcomes. Overall, AI plays a significant role in strengthening strategic decision-making and supporting long-term organizational growth.

Keywords: Artificial Intelligence, Strategic Decision Making, Data Analytics, Business Strategy, Decision Support Systems.

Paper Id: A204

Analysing the Impact of Analytics on Business Performance

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Abstract

Nowadays, organizations are to a larger extent depending on data analytics for strategic decision making, operational efficiency enhancement, and performance of business in the main hall. As the analytical tool and method development is very fast, companies can use data for their benefits and to increase their share in the market. Data analytics is a key contributor to various business functions such as quality control in products, inventory control through business intelligence, supply chain management optimization, and pricing strategies implementation. This paper is intended to investigate the impact of pervasive use of analytics on the business performance in data rich environments. Business performance is a result of many interrelated factors, not only sales activities or product promotions. Therefore, it is critical to comprehend these interactions for creating successful strategies. One-possible way to use system dynamics model as a first step to identifying the relationships between various organizational factors, and which factors or combination of factors that lead to business performance improvement. The paper presents an analysis of a dataset on company performance to review roles and interlinkages between operational, financial, and overall business results metrics. Several data analytical methods were used such as exploratory data analysis, correlation analysis, and descriptive statistics to understand the dataset. The results show that proper application of analytics and visualizing data tools changes data into helpful information which results in better decision-making, lower operational costs, more revenue opportunities, and higher customer engagement.

Keywords: Business Analytics, Data-Driven Decision Making, Organizational Performance, Predictive Analytics, Performance Optimization.

Paper ID: A205

RENEWABLE ENERGY DRIVEN SMART SPRAYER WITH SOLAR TRACKING TECHNOLOGY

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ABSTRACT

Agriculture plays a vital role in food production, and effective pest control is essential to improve crop yield and quality. Conventional pesticide sprayers, such as hand-operated and engine-driven models, cause significant farmer fatigue, noise, vibration, and environmental pollution due to fossil fuel usage. To overcome these limitations, this project presents the design and fabrication of a solar-operated pesticide sprayer with an automatic solar tracking system. The proposed system utilizes a photovoltaic solar panel to convert solar radiation into electrical energy, which is stored in a rechargeable battery. The stored energy is used to drive a DC motor coupled with a pump for spraying pesticides. An automatic tracking mechanism employing Light Dependent Resistors (LDRs) and a motor driver circuit ensures that the solar panel continuously aligns with the sun, thereby maximizing energy generation efficiency. The system reduces dependence on non-renewable energy sources, eliminates fuel costs, minimizes air pollution, and decreases physical strain on farmers. It is economical, eco-friendly, and suitable for both small and medium-scale agricultural applications. The incorporation of renewable energy and automation enhances overall spraying efficiency and promotes sustainable agricultural practices.

Keywords Solar Sprayer, Renewable Energy, Photovoltaic System, Solar Tracking System, Pesticide Spraying, DC Motor Pump, LDR Sensor, Sustainable Agriculture, Automatic Sprayer, Eco-Friendly Technology.

Paper Id: A206

Fabrication and Testing of Sugarcane Bud Cutting Machine

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Abstract

Sugarcane is one of the major commercial crops cultivated widely for sugar and bio-energy production. Conventional sugarcane planting involves the use of whole cane setts, which requires a large quantity of seed material, increases cost, and results in low germination efficiency. Bud chip technology has emerged as an effective alternative, but manual bud cutting is labor-intensive, time-consuming, and inconsistent. To overcome these limitations, a sugarcane bud cutting machine was designed, fabricated, and tested to improve efficiency, accuracy, and uniformity of bud separation. The developed machine consists of a mild steel frame, feeding mechanism, cutting blade assembly, power transmission system, and collection unit. The cutting mechanism is designed to isolate individual buds along with a small portion of the nodal region without damaging the bud eye. Power is supplied through an electric motor, and rotational motion is transmitted to the cutting blade via belt and pulley arrangement. Safety guards and adjustable settings are incorporated to accommodate sugarcane stalks of varying diameters. Performance testing of the machine was carried out using different sugarcane varieties to evaluate parameters such as cutting efficiency, bud damage percentage, output capacity, and operational ease. The results indicated that the machine achieved high bud cutting efficiency with minimal bud damage and significantly reduced Labour requirement and processing time compared to manual methods

Keywords: Sugarcane Bud Cutting, Bud Chipping Machine, Agricultural Machinery, Sugarcane Plantation, Semi-Manual Bud Cutting Machine, Mechanization in Agriculture, Cutting Mechanism.

Paper Id: A207

Operational and Economic Viability of Drone Based Last-Mile Delivery in Quick Commerce

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Abstract

The fast growth of quick commerce platforms has significantly increased the need for efficient and cost effective last mile delivery solutions in urban areas. Emergent technologies such as unmanned aerial vehicles (UAVs), also known as delivery drones have been viewed as potential alternative to traditional rider delivery systems. This study aims to evaluate the economic and operational feasibility of using drones for delivery in Tier-1 Indian cities. Using a dataset of quick commerce delivery orders, an optimization model based on binary integer programming was developed to determine the optimal allocation of deliveries between drones and traditional rider based delivery. The model aims to minimize total delivery cost while taking into consideration operational constraints like drone range, payload capacity, delivery time and fleet size limitations. To account for the uncertainty in drone operating costs, a sensitivity analysis was conducted for three cost scenarios: conservative, mid, optimistic. The results show that under conservative and mid range cost assumptions, drone deployment becomes economically unfeasible compared to rider delivery. However, under optimistic conditions, limited drone allocation becomes a feasible option for deliveries within a fixed small radius. The findings indicate that the economic viability of drone delivery systems is highly sensitive to capital costs, operational efficiency and fleet utilization rates. This study gives insight for logistics operators and policymakers for the conditions under which drone delivery can become a viable component of urban last mile logistics.

Keywords: Quick Commerce, Drone Delivery, Cost Optimization, Binary Integer Programming, Sensitivity Analysis

Paper ID A208

“Gen-Z and Option Trading in India: An Empirical Study on the Interplay of Market Data, Digital Engagement, and Risk Behaviour”

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ABSTRACT

Purpose: This study investigates the determinants of Gen-Z participation and risk-taking behaviour in Indian options trading, focusing on the interplay between behavioural biases (overconfidence, FOMO, herd behaviour), digital investor attention, and market outcomes.

Methodology: Using a mixed-method approach combining primary survey data from 1,200 Gen-Z option traders across six Indian metropolitan cities with secondary market data from the National Stock Exchange (NSE), we employ fixed-effects logistic regression, negative binomial regression, and Arellano-Bond dynamic panel GMM estimation to analyse trading behaviour.

Findings: FOMO (Fear of Missing Out) emerges as the strongest behavioural predictor of both trading participation (log-odds ratio: 0.52, $p < 0.01$) and frequency (incidence rate ratio: 1.46, $p < 0.01$), exceeding the effects of overconfidence and herd behaviour. Digital attention significantly predicts trading behaviour and amplifies the effect of FOMO (interaction coefficient: 0.16, $p < 0.05$). Trading behaviour exhibits substantial state dependence (lagged coefficient: 0.38, $p < 0.01$). Financial literacy is negatively associated with participation (coefficient: -0.15, $p < 0.01$).

Originality/Value: This study contributes to behavioural finance literature by documenting the unique characteristics of Gen-Z derivative trading in an emerging market context. The combination of primary behavioural data with market metrics and dynamic panel methods provides robust evidence on the mechanisms driving retail options trading.

Keywords: Gen-Z Investors; Option Trading; Behavioural Biases; FOMO; Overconfidence; Herd Behaviour; Digital Attention; Arellano-Bond GMM; India
JEL Classification: G41; G53; D91; O16

Paper Id: A209

A HYBRID DEEP LEARNING FRAMEWORK FOR MULTI-TYPE CHEST X-RAY ABNORMALITY CLASSIFICATION AND LOCALIZATION USING EXPLAINABLE AI TECHNIQUES

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Abstract

Early and accurate identification of lung-related abnormalities from chest X-ray images is essential for effective diagnosis and treatment. This project presents a deep learning-based system for multi-class disease classification combined with explainable artificial intelligence to enhance transparency and reliability in medical image analysis. The proposed system utilizes a structured dataset consisting of five disease categories: COVID, Lupus, Normal, Pneumonia, and Tuberculosis. A transfer learning approach is adopted using a pretrained ResNet-50 architecture to extract meaningful features and improve classification performance. The input images are preprocessed through resizing, normalization, and data cleaning to ensure consistency and quality. To enhance interpretability, Grad-CAM++ is integrated into the system to generate high-resolution heatmaps that highlight the regions influencing the model's prediction. In addition, OpenCV-based image processing techniques are used to localize abnormalities by identifying significant regions and drawing bounding boxes. An interactive inference system is also developed to enable real-time image analysis and visualization. The proposed system demonstrates effective classification performance while providing meaningful visual explanations, making it a reliable tool for assisting healthcare professionals in chest disease detection and analysis.

Keywords: Chest X-ray, Deep Learning, ResNet-50, Transfer Learning, Grad-CAM++, Explainable AI, Medical Image Analysis, Disease Classification, Localization

Paper Id: A210

Wind-Regenerative System for EV Charging using Air Pressure

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ABSTRACT

The rapid increase in electric vehicle (EV) adoption has intensified the need for sustainable and efficient energy management systems to extend driving range and reduce dependency on conventional charging infrastructure. This project presents the design and implementation of a hybrid renewable energy powered electric vehicle that integrates solar energy, windmill-based energy generation, and wind-regenerative technology. The proposed system enables energy harvesting during both stationary and moving conditions, thereby improving overall energy efficiency. A dual-battery configuration is employed, consisting of a primary battery and a backup battery, with a manual switching mechanism to ensure uninterrupted vehicle operation during low-voltage conditions. The vehicle's motion, including forward and reverse directions, is controlled exclusively through a mobile application, eliminating the need for physical switches. The mobile application also provides real-time monitoring of solar voltage, wind power generation, and battery voltage levels, allowing the user to assess system performance continuously. By effectively managing and utilizing multiple renewable energy sources, the proposed system demonstrates a practical approach toward eco-friendly transportation, enhanced reliability, and reduced dependence on grid-based charging.

Paper Id: A211

Enhanced Brain Tumour Segmentation and Classification Using Dragonfly-Optimized G-K Fuzzy Clustering and Histogram-Based Feature Extraction

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Abstract

Brain tumour segmentation and classification are critical tasks in medical imaging, directly influencing diagnosis, treatment planning, and patient outcomes. Traditional clustering methods such as Fuzzy C-Means (FCM) and K-means are widely used but suffer from limitations including sensitivity to noise, inability to handle non-spherical clusters, and dependence on initial parameters. This paper proposes a novel hybrid framework that integrates Gustafson–Kessel (G-K) fuzzy clustering with the Dragonfly Algorithm (DA) for optimized brain tumour segmentation and classification from Magnetic Resonance Imaging (MRI) data. The proposed method incorporates a Wiener filter for pre-processing, a histogram-based technique for tumour region segmentation, and Gray-Level Co-occurrence Matrix (GLCM) for feature extraction. The G-K clustering process is optimized using DA to adaptively tune cluster parameters, improving segmentation accuracy and classification robustness. Experimental evaluation on the BraTS dataset demonstrates that the proposed model outperforms existing methods in terms of accuracy, recall, precision, and Dice coefficient. The results indicate that the DA-optimized G-K clustering model provides a more reliable, efficient, and clinically applicable solution for automated brain tumour analysis.

Keywords: Brain tumour segmentation, G-K fuzzy clustering, Dragonfly Algorithm, MRI, Histogram-based segmentation, GLCM, Optimization, Medical image analysis.

Paper Id: A212

A Digital Support Portal for Persons with Disabilities

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Abstract

Persons with disabilities often face many challenges in accessing important information, government schemes, job opportunities, and support services. In many cases, these resources are available on different websites and platforms, which makes it difficult for users to find the required information easily. Lack of accessibility features in many systems also creates barriers for persons with disabilities. The proposed project, “A Digital Support Portal for Persons with Disabilities,” aims to develop a centralized digital platform that provides easy access to important resources and services for disabled individuals. The portal collects information such as government schemes, employment opportunities, support organizations, and guidance services in a single platform. The system is designed with a simple and user-friendly interface so that persons with different types of disabilities can navigate and use the portal easily. The platform also helps users stay updated with the latest opportunities and support programs. By using this portal, persons with disabilities can quickly access reliable information, reduce the time spent searching for resources, and improve their awareness of available support services. Overall, the project promotes digital accessibility, inclusion, and empowerment for persons with disabilities through the effective use of technology.

Keywords: Digital Support, Job Recommendation, Scheme Eligibility Checker, Location-Based Services, Multi-Language Support.

Paper ID: A213

Impact of Resource Utilization and Cost Drivers on Financial Performance

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ABSTRACT

This study examines the effect of resource utilization and cost drivers on the financial performance of a manufacturing firm. The main objective is to evaluate how efficiently organizational resources such as labour, machinery, and raw materials are used in the production process and how different cost drivers influence the overall cost structure of the organization. Efficient utilization of resources plays an important role in improving productivity, minimizing wastage, and enhancing operational efficiency, which can contribute to better financial outcomes. Cost drivers help identify the factors that cause costs to occur during various production activities and provide a clearer understanding of how expenses are generated within the organization. The study is based on secondary data collected from company reports, financial statements, and other relevant records over a selected period. In this research, resource utilization and cost drivers are treated as independent variables, while financial performance measured through Return on Assets (ROA) is considered the dependent variable. Statistical techniques are used to analyze the relationship between these variables. The findings indicate that effective management of resources and proper identification of cost drivers can improve cost control and support better financial performance.

Key Words: Resource Utilization, Cost Drivers, Financial Performance.

Paper Id: A214

Digital Financial Readiness as a Behavioral Enabler of MaaS Adoption in Rural India: A Hybrid PLS-SEM - ANN Approach

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Abstract

In addition to transport integration, users' digital financial readiness is an important consideration for successful deployment of Mobility-as-a-Service (MaaS) platforms especially in rural and semi urban parts of developing economies. Since MaaS relies heavily on smartphone-based applications, digital payments and trust within the ecosystem, financial inclusion and digital behavior represent critical enablers of mobility inclusion. This study investigates the role of digital financial readiness towards MaaS adoption readiness in rural India through the twin mediating mechanisms of financial attitude and financial behavior. This study adopted a quantitative research design, where primary data were generated from 220 rural respondents via structured questionnaires. Partial Least Squares–Structural Equation Modelling (PLS-SEM) was used to test hypothesized relationships, followed by Multilayer Perceptron (MLP) neural network to check predictive validity and its non-linear effects. The findings show that digital infrastructure plays a relevant role in financial attitude, which consequently has a positive impact on financial behavior and mediates MaaS adoption readiness. The behavioral dimension was found to be most critical for enabling participation on the digital mobility landscape; financial behavior appeared as the strongest direct predictor. Similarly, the other antecedents (fintech awareness, financial knowledge, financial literacy, perceived ease of use, perceived usefulness, self-efficacy, social influence and trust) were not statistically significant in the structural model. The hybrid PLS-SEM–ANN framework exhibits strong explanatory and predictive ability to reveal mobility inclusion driven by financial behavior. The results provide important suggestions for policymakers, MaaS operators and digital mobility service providers to develop inclusive smart mobility solutions through enhanced rural digital infrastructures and the promotion of sustained financial behavioral engagement. Keywords: FinTech adoption, financial inclusion, financial behavior, Perceived Usefulness, PLS-SEM, Multilayer Perceptron, R-square, Neural network, ANN.

Paper Id: A215

The Role of Value Co-Creation and Customer Engagement in Driving Brand Advocacy and Revisit Intention in a Board Game Startup with Reference to Coimbatore

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Abstract

The Role of Value Co-Creation and Customer Engagement in Driving Brand Advocacy and Revisit Intention in a Board Game Startup with Reference to Coimbatore reflects the increasing importance of customer participation in shaping experiential service outcomes. Emphasis is placed on how value co-creation enhances customer engagement and how such engagement contributes to advocacy behavior and the intention to revisit. The mediating influence of customer engagement between value co-creation and brand advocacy is also considered. Data were gathered from 120 respondents through a structured questionnaire based on a five-point Likert scale, using a convenience sampling approach. SPSS was employed for analysis, where reliability of the constructs was verified, followed by descriptive measures and Pearson correlation to examine associations among variables. The results indicate a positive linkage between value co-creation and customer engagement, with engagement further influencing both brand advocacy and revisit intention. The presence of customer engagement strengthens the indirect relationship between value co-creation and advocacy outcomes. The findings highlight the need for board game startups to design participative and engaging experiences that encourage customer involvement, leading to stronger relationships, positive recommendations, and repeat patronage.

Keywords: Value Co-Creation, Customer Engagement, Brand Advocacy, Revisit Intention, SPSS

Paper Id: A216

Antibacterial Activity of Essential Oils from *Ocimum tenuiflorum* and *Azadirachta indica* Against Bacteria Isolated from Industrial Wastewater

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Abstract

A wide variety of microorganisms, including germs that could be harmful to the environment and public health, are frequently found in industrial effluent. Researchers are looking at natural antimicrobial medicines made from medicinal plants since harmful bacteria are becoming more resistant to traditional antibiotics. It is well recognized that essential oils derived from therapeutic plants include a range of bioactive substances with important antibacterial qualities. The current study examines the antibacterial activity of essential oils derived from *Azadirachta indica* and *Ocimum tenuiflorum* against bacterial isolates taken from industrial wastewater. Neem (*Azadirachta indica*) and Tulsi (*Ocimum tenuiflorum*) are well-known medicinal plants that are frequently utilized in traditional medical systems due to their therapeutic qualities. Numerous physiologically active components found in its essential oils, including phenolic compounds, terpenoids, and flavonoids, have potent antibacterial, antioxidant, and anti-inflammatory properties. Wastewater from a variety of industrial activities can contain a wide variety of bacterial species that pollute the environment and can spread illness. Therefore, investigating the potential of essential oils obtained from plants as natural antibacterial agents against such germs could offer an environmentally benign and sustainable method of microbial control. In this work, samples of industrial wastewater were taken from specific industrial locations and microbiologically analyzed to identify and isolate bacterial strains using conventional culture methods. On suitable growth media, the isolated bacteria were cultivated and purified. Using standard antimicrobial screening techniques like the agar well diffusion technique, essential oils derived from Tulsi and Neem plant materials were then evaluated for their antibacterial activity against the isolated bacterial strains. To assess how well the essential oils inhibited bacterial growth, the zones of inhibition they created were evaluated. The presence of active phytochemical that damage bacterial cell membranes, obstruct enzyme activity, and impede microbial metabolism may be the cause of this inhibitory action. These qualities make these essential oils attractive substitutes for artificial antibacterial agents. Additionally, using plant-based antimicrobial agents has benefits including reduced toxicity, biodegradability, and environmental effect. Overall, this study shows how essential oils from medicinal plants may be used as natural antibacterial agents to reduce bacterial contamination in industrial effluent. Additionally, the study backs the increasing interest in using bioactive chemicals produced from plants in sustainable industrial practices and environmental biotechnology.

Keywords : Antimicrobial, Antibiotics, Terpenoids, Flavonoids, Anti-inflammatory, Phytochemical, Biodegradability, Bioactive.

Paper Id: A217

Relaxor Ferroelectric Materials: Fundamental Mechanisms, Energy Storage Applications

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Abstract

Achieving a material with a high dielectric constant, large dielectric breakdown strength, and slim hysteresis is essential for superior energy performance. In this regard, relaxor ferroelectrics (RFEs) have emerged as the most promising solution for energy storage dielectric capacitors. These capacitors are garnering significant attention due to their low cost and high operating voltages, making them suitable for a wide range of applications, from basic consumer electronics to advanced pulsed power technology (PPT). PPT requires higher operating voltages, typically around 100 kV, for applications in space shuttle power systems, advanced aircraft, electromagnetic armor, and more. Unlike batteries and electrochemical capacitors, dielectric capacitors can operate for extended periods under high voltages (in the megavolt range). They also exhibit superior thermal stability (up to 250°C), which is crucial for applications in electric vehicles, oil well drilling machinery, and aircraft engines, where power delivery at high temperatures is essential. Most importantly, dielectric capacitors can rapidly intake and discharge energy within a very short time frame (microseconds to nanoseconds), making them ideal for energy storage applications in PPTs. This capability positions dielectric capacitors as a leading choice for energy storage in high-demand, high-voltage environments.

Keywords: Ferroelectric, Energy storage density, Long-range order, Perovskites, Lead-free ceramics.

PAPER ID: A 218

**UPLIFTMENT OF FARMERS THROUGH THE
WELFARE SCHEMES OF GOVERNMENT OF
ASSAM: A STUDY ON THE ITAKHOLA
PANCHAYAT, ASSAM**

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ABSTRACT

Assam is a beautiful place with the immense possibilities of producing kinds of crops around the total of India. Then, nearly 80 percent people dependent on husbandry. The people of assam mostly dependent on agriculture and horticulture. With the limited resources they producing a well quality of rice and other commodities. The Joha rice is the well brand of Assam's farmers. The farmers with the use of modern technology are reducing the risk of hazards. But it is also true that the growers are not able and proficient in coping with the climate change and soil erosion as well as with the biodiversity losses which consequently results in their less productivity as well as their mental stress. The govt of India as well as the government of Assam working hand by hand to look into the risk and issues faced by Assam's farmers or growers. The schemes like – Pradhan Mantri Samman Nidhi Yojana, Paramparagat Krishi Vikas Yojana, Fisheries Training and Extension Program scheme and the MIF (Micro Irrigation Fund) all are the initiative of central and govt of Assam to tackle the issues and problems of rural growers. Various research revealed that the beneficiaries are not benefited as expected. Kumar (2020) explored the stylish practices of information knowledge especially regarding schemes espoused by the farmers of Assam with respects to husbandry and also it also some point creates hurdle in growing of crops by the growers. It is also need to accept that central and state government have been putting many programs into place to help farmers to develop their agricultural skills. Every plan began with unique goals and objectives. The effects of government programs on farmers are noticeable.

Keywords: Farmers, growers, Assam, agriculture, schemes, government.

Paper Id: A219

DEVELOPMENT OF A SOLAR HEATED FOG WATER COLLECTION SYSTEM

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Abstract

Water scarcity is becoming a serious issue in many parts of the world. The Solar Heated Fog Water Collection System is developed to collect water from fog present in the atmosphere and utilize it for domestic purposes. Fog contains tiny water droplets suspended in the air. When fog passes through a specially designed mesh net, the droplets collide with the surface, combine to form larger droplets and drip down into a collection channel. The collected water is then directed to a storage tank. In this system, solar heating is integrated to improve the efficiency of water collection. The solar heater slightly warms the collection surface, which enhances condensation and allows the droplets to flow more easily. The collected water can be used for household activities such as washing, cleaning and other domestic needs. This system is simple, eco-friendly and cost-effective, making it suitable for fog-prone areas like hilly and coastal regions where freshwater availability is limited.

Keywords: Fog Water Collection, Solar Heating, Fog Harvesting, Mesh Collector, Domestic Water Use.

Paper Id: A220

A Blockchain-based Security Management Framework for Cyber-Physical Systems

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Abstract

The Single sign-on (SSO) is a new authentication mechanism that enables a legal user with a single credential to be authenticated by multiple service providers in a distributed computer network. Recently, Chang and Lee proposed a new SSO scheme and claimed its security by providing well-organized security arguments. In this paper, however, we demonstrate that their scheme is actually insecure as it fails to meet credential privacy and soundness of authentication. Specifically, we present two impersonation attacks. The first attack allows a malicious service provider, who has successfully communicated with a legal user twice, to recover the user's credential and then to impersonate the user to access resources and services offered by other service providers. In another attack, an outsider without any credential may be able to enjoy network services freely by impersonating any legal user or a nonexistent user. We identify the flaws in their security arguments to explain why attacks are possible against their SSO scheme. Our attacks also apply to another SSO scheme proposed by Hsu and Chuang, which inspired the design of the Chang–Lee scheme. Moreover, by employing an efficient verifiable encryption of RSA signatures proposed by Ateniese, we propose an improvement for repairing the Chang–Lee scheme. We promote the formal study of the soundness of authentication as one open problem.

Keywords: Blockchain, Single Sign-On (SSO), Cybersecurity, Authentication, Data security, Cryptography.

PAPER ID : A221

SMART SYSTEM FOR PRECISION AGRICULTURE USING IOT-BASED ANALYTICS

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Abstract:

... The project focuses on developing a smart system for precision agriculture using IoT-based analytics to improve irrigation management and efficient water utilization in agricultural fields. Precision agriculture aims to enhance farming efficiency by integrating modern technologies for better monitoring and control of agricultural resources. In many farms, underground drip irrigation systems are commonly used to supply water directly to the root zone of crops, which improves water use efficiency. However, most conventional irrigation systems operate with basic automation and do not provide real-time monitoring of soil conditions. In the proposed system, soil moisture sensors are installed in the agricultural field to continuously monitor the moisture content of the soil near the crop root zone. The sensor data is transmitted through IoT technology to a microcontroller and further sent to a monitoring platform for analysis. Based on the analysed data, the system automatically controls the irrigation process when the soil moisture level falls below the required threshold value. This enables automatic activation and deactivation of the irrigation system according to the soil moisture conditions. The implementation of this smart irrigation system helps in efficient water management, reduces manual intervention and ensures that crops receive the required amount of water at the right time. The proposed system also allows real-time monitoring of field conditions, which supports better decision-making for farmers. Overall, the developed system contributes to sustainable agriculture by improving irrigation efficiency, optimizing water usage and enhancing crop productivity in underground drip irrigation systems.

Keywords: Precision Agriculture, Internet of Things (IoT), Soil Moisture Sensor, Smart Irrigation, Underground Drip Irrigation, IoT Analytics.

Paper Id: A222

DESIGN AND ASIC REALIZATION OF THE RISC-V RV32A ATOMIC INSTRUCTION SET EXTENSION

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ABSTRACT

This paper details the design and synthesis of an Application-Specific Integrated Circuit (ASIC) for the RISC-V RV32 architecture. The design supports load and store operations, as well as atomic memory operation (AMO) commands. The Verilog implementation describes a memory access path along with Verilog implementations of the read-modify-write logic for AMOs. Simulation testing was used to demonstrate the functional correctness of the firm and confirmed that each instruction produced the expected result. In addition, the results indicated that each intended module was synthesizable into the ASIC and could be integrated into an ASIC design. The design was achieved using a modular technique whereby each memory operation could be verified and integrated separately. The AMOs are designed to implement consistent memory sequence operations in conjunction with basic arithmetic operations (Add, Or, And..) through the application of the AMOs' associated register update logic. Simulation waveforms confirmed the successful transfer of information (register updates) across the system architecture for both standard and atomic operations. In summary, this project provides an ASIC design architecture for providing atomic functions in future RISC-V based systems.

Index terms --Application specific Integrated Circuit (ASIC), Fifth generation of Reduced Instruction Set Computer (RISC-V), Atomic Extension, Atomic memory operation(AMO) Instructions, Load- Reserved, Store- Conditional.

Paper Id: A223

Bioactive Leaf Fractions of *Annona muricata* Exhibit Cytotoxicity Against MOLT-3 Leukemic Cells

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Abstract

The anticancer potential of *Annona muricata* leaf fractions is examined in this work using the MOLT-3 (T-ALL) cell line. GC–MS and FTIR spectroscopy were used to perform phytochemical profiling of the bioactive fraction (F4C). Different functional groups were detected by FTIR analysis, and the F4C fraction included several phytoconstituents that were identified by GC-MS. Using cytotoxic assays, the cytotoxic activity of F4C against MOLT-3 cells was verified. F4C therapy caused G0/G1 phase arrest, according to cell cycle studies. Moreover, mitochondrial dysfunction was indicated by JC-1 staining, which revealed a significant decrease in mitochondrial membrane potential (MMP). All of these results point to the possibility that *Annona muricata* leaf fractions have strong anticancer effects on MOLT-3 cells, mainly through mitochondrial integrity disruption and apoptosis induction.

Keywords - *Annona muricata*, T-ALL, G0-G1 arrest, MMP, JC-1 staining.

Paper Id: A224

SMART INTEGRATION OF AI AND IOT BASED WATER DISTRIBUTION AND MONITORING SYSTEM FOR TEXTILE DYEING INDUTRY

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Abstract

The textile dyeing industry requires efficient water management to reduce wastage and ensure sustainable operations. This project presents a smart integration of Artificial Intelligence (AI) and Internet of Things (IoT) for optimized water distribution and monitoring. IoT sensors are deployed to continuously measure parameters such as water flow, pressure, pH, and turbidity in different sections of the dyeing process. The collected data is transmitted to a cloud platform through a microcontroller-based gateway. AI algorithms are applied to analyze real-time and historical data to predict water demand, detect anomalies, and optimize distribution across multiple blocks. The system uses automated control mechanisms such as pumps and valves to regulate water flow based on AI-driven decisions. A user-friendly dashboard provides live monitoring, alerts, and predictive insights to improve operational efficiency. This integrated approach reduces water wastage, enhances process control, and supports sustainable industrial practices. The proposed system is cost-effective, scalable, and suitable for modern textile industries aiming for smart water management solutions.

Keywords: AI, IoT, Water Distribution, Textile Dyeing, Smart Monitoring, Automation

Paper Id: A225

A Study on Trends in Smart Manufacturing Technologies

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Abstract

Mechanical Engineering is undergoing significant transformation due to rapid advancements in smart manufacturing technologies and digital innovations. Emerging trends such as Industry 4.0, automation, robotics, additive manufacturing (3D printing), and the Internet of Things (IoT) are revolutionizing traditional manufacturing processes. These technologies enhance productivity, precision, and efficiency while reducing production time and operational costs. Smart manufacturing systems integrate advanced sensors, data analytics, and artificial intelligence to enable real-time monitoring, predictive maintenance, and improved decision-making in industrial operations. Automation and digital manufacturing systems also reduce human error and operational costs while increasing precision and sustainability. Additionally, the adoption of advanced materials and sustainable manufacturing practices contributes to environmentally friendly production and resource optimization. Furthermore, the adoption of Industry 4.0 concepts is enabling interconnected and intelligent manufacturing environments. As a result, mechanical engineers are increasingly required to integrate digital tools, data analytics, and smart technologies to meet the demands of modern industrial development and global competitiveness. This paper highlights the importance of integrating modern technologies in mechanical engineering to improve industrial competitiveness, foster innovation, and support the development of intelligent and flexible manufacturing systems for future industries.

Keywords: Smart Manufacturing, Additive Manufacturing, Industry 4.0, Artificial Intelligence, Internet of Things (IoT), Robotics.

Paper Id: A226

Linear Phase Filter Design Using Namib Beetle And Salp Swarm Algorithm For Ripple Reduction

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Abstract

Ripple reduction is a significant challenge in power electronic systems because excessive ripple can reduce efficiency, generate unwanted heat, and shorten the lifespan of electronic components. To overcome these limitations, this project proposes a hybrid optimization approach that combines Namib Beetle Optimization (NBO) and the Salp Swarm Algorithm (SSA) for effective ripple minimization in linear phase filter design. The Namib Beetle Optimization algorithm is inspired by the food-searching behavior of desert beetles and is mainly used for global exploration of the search space. In contrast, the Salp Swarm Algorithm is inspired by the swarming behavior of salps in the ocean and is effective in local exploitation and faster convergence. By integrating these two algorithms, the proposed hybrid NBO–SSA method balances exploration and exploitation, enabling efficient optimization of controller parameters and filter coefficients. In this work, The hybrid algorithm is implemented in MATLAB to tune the PI controller parameters and optimize the linear phase filter design. Simulation results show that the hybrid NBO–SSA algorithm achieves better ripple reduction and faster convergence compared to existing methods, while also reducing computational complexity and energy consumption.

Keywords: Namib Beetle Optimization , Salp Swarm Algorithm ,Linear phase filter

Paper Id: A227

Decoding the Business: Role of Indian Knowledge System in Enterprise Sustenance

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Abstract:

Kutumb (family) plays an important role in Indian knowledge system. Family not only concerned about being together but it also plays a pivotal role as a support system in managing work-life balance as well as entrepreneurial activities. Historically, women are integral part of work-force in every field. Since Vedic periods (5000 years ago) women have contributed in many fields especially handling the family business from farming, defence, education till Vedic philosophy. The Indian knowledge system enabled the work-life balance by integrating women as workforce and as a mother aided by many people within family. Thus facilitating blissful motherhood as well as working together. After colonial invasion, since past 200 years our family systems go through a paradigm shift of thoughts from considering family achievements or benefits as motive to individual achievement as motive. Thus the objective of paper is to study and analyse the role of Indian knowledge system in managing work-life balance and enterprise sustenance in an Indian context.

An exploratory descriptive research design is selected through a qualitative approach. A case study method is selected to understand the effects of family support by mapping with existing factors influencing work-life balance and enterprise sustenance. The case has been analysed through explanation building technique. The present paper sheds light on the importance of family values of Indian knowledge system in managing enterprise sustenance. The findings of the case emphasize the pivotal role of family in financial, experiential, emotional, and networking support in starting and managing entrepreneurial venture. Thus leading to a managed work-life balance with enhanced clarity of thoughts at the workplace as well as at home.

Keywords: Indian knowledge system, Work-life balance, Entrepreneurship, Case study

Paper Id: A228

**NEXT GEN BREAST CANCER SCREENING:
NANOBIOSENSOR DATA AND MULTIMODEL ML
CLASSIFICATION**

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Abstract

This project focuses on improving breast cancer detection using nanobiosensor data combined with statistical analysis and machine learning techniques implemented in Python programming. The study involves preprocessing a standardized breast cancer dataset using methods such as missing value handling, feature transformation, normalization, and correlation analysis. Multiple machine learning models will be developed and compared for tumor classification, including Support Vector Machine (SVM), Random Forest, Decision Tree, K-Nearest Neighbors (KNN), Artificial Neural Network / Multi-Layer Perceptron (ANN/MLP), and Fuzzy ELM-RBF models. These models will be evaluated using appropriate performance metrics to identify the most accurate and clinically reliable approach. The objective is to build a robust and data-driven diagnostic framework that enhances early detection accuracy and supports practical healthcare decision-making.

Keywords: Breast cancer detection, Machine Learning, Python.

Paper ID: A229

Modified Homotopy Perturbation Method in Nonlinear Vibration of Membranes

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Abstract

The present article deals with the study of nonlinear vibrations in an orthotropic rectangular membrane, based on Von Kármán's large deflection theory and D'Alembert's principle of membrane. An approximate solution for the frequency and displacement functions regarding nonlinear free vibration of large amplitude in rectangular membrane with simply supported edges has been obtained. Further, as a numerical example the mode shapes of membrane and displacement-time curve of five feature points on the membrane surface are also discussed. A modified homotopy perturbation method is used to study this phenomenon. The homotopy perturbation method is modified by truncating the infinite series corresponding to the first-order approximate solution before introducing it in the second order linear differential equation. The present study provides some theoretical platform for obtaining the response of membrane structures under dynamic loads and in addition, computational basis for the vibration control and dynamic design of building membrane structures. A good agreement of the approximate frequencies and solutions with the exact one has been demonstrated, discussed and presented graphically.

Keywords: Nonlinear vibration, Von Kármán's theory, mode shapes, frequency, modified homotopy perturbation method.

Paper Id: A230

An AI-Driven College Admission Assistant for Intelligent Course and Institutional Selection

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Abstract

The college admission process is often complex for students due to the large number of institutions, courses, and eligibility requirements available. Many students face difficulties in selecting suitable colleges and programs based on their academic performance and interests. To address this challenge, this project proposes an AI-driven College Admission Assistant that helps students explore colleges, courses, and admission requirements through an intelligent and user-friendly platform. The system provides personalized guidance by integrating a web-based interface with an AI-powered assistance module that responds to admission-related queries in real time. The platform enables students to search for colleges, view course details, understand eligibility criteria, and track application-related information efficiently. The backend of the system is developed using FastAPI, while the frontend is implemented using React to provide a responsive and interactive user experience. By centralizing admission-related information and providing instant assistance, the proposed system simplifies the decision-making process for students and improves accessibility to reliable admission guidance. This platform can serve as an effective digital support tool for students seeking engineering admissions.

Keywords: Artificial Intelligence, College Admission System, FastAPI, React, Educational Technology.

Paper ID: A231

AI-Based MRI Image Denoising Using Deep Learning

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ABSTRACT

Magnetic Resonance Imaging (MRI) is an essential tool in modern medical diagnosis, particularly for detecting neurological and oncological disorders. However, MRI images are often degraded by noise due to scanner limitations, rapid acquisition techniques, and patient movement, which reduces image clarity and affects diagnostic accuracy. Traditional denoising methods rely on filtering techniques that often remove important structural details and fail to capture complex noise patterns present in medical images. To address these challenges, this project introduces an AI-based MRI image denoising system using deep learning. The proposed framework utilizes a Convolutional Neural Network (CNN)-based encoder-decoder architecture developed using PyTorch to enhance image quality. The model is trained on the IXI dataset, where synthetic noise is added to simulate real-world conditions, enabling the system to learn the mapping between noisy and clean images effectively. As a result, the model produces high-quality denoised MRI scans while preserving fine anatomical structures. The system also includes an inference pipeline integrated with a Streamlit-based web application, allowing real-time processing and user-friendly interaction. This ensures accessibility and practical usability in healthcare environments. By improving image clarity and reducing noise, the proposed solution enhances diagnostic accuracy, minimizes the need for repeated scans, and supports better clinical decision-making. Overall, the project demonstrates the effectiveness of deep learning in medical image processing and provides a reliable, accurate, and deployable solution for improving healthcare outcomes.

Keywords—MRI Image Denoising, Deep Learning, Convolutional Neural Network(CNN), IXI Dataset, PyTorch, Streamlit

Paper ID: A232

COGNIFORE AI FOR FMCG DEMAND FORECASTING & SUPPLY CHAIN OPTIMIZATION SYSTEM

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Abstract

The Fast Moving Consumer Goods (FMCG) industry operates in a highly competitive market where accurate demand forecasting plays a crucial role in maintaining efficient supply chain operations. Traditional forecasting methods often struggle to capture complex demand patterns influenced by seasonal trends, promotional campaigns, and changing consumer behavior. This research proposes an AI-driven demand forecasting and supply chain optimization framework designed specifically for the FMCG sector. The proposed system utilizes machine learning algorithms to analyze historical sales data and generate accurate demand predictions. Furthermore, the system integrates inventory optimization techniques to ensure optimal stock levels while minimizing operational costs. Index Terms—Demand Forecasting, FMCG Analytics, Machine Learning, Supply Chain Optimization, Predictive Analytics.

Paper Id: A233

The Influence of Financial Behaviour, Financial Literacy and Financial Stress on Financial Well-being among Employed Individuals

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Abstract

Financial well-being is an important determinant of overall life satisfaction and financial stability, especially for employed individuals who handle financial income, savings, debt, and financial planning. This research paper investigates the impact of financial literacy, financial stress, financial behavior, financial attitude, and financial trust on financial well-being by combining Partial Least Squares Structural Equation Modeling (PLS-SEM) and Neural Network models. The data was collected from 100 employed participants using a structured questionnaire with a five-point Likert scale. The findings from the PLS-SEM analysis show that financial behavior has a positive and significant effect on financial well-being. Financial literacy and financial stress have significant effects on financial behavior, but not on financial well-being. The results from the mediation analysis support that financial behavior acts as a mediator for the relationships between financial literacy, financial stress, and financial well-being. Moreover, financial trust has a significant and positive effect on financial well-being, but financial attitude lacks a significant effect. The Neural Network analysis further supports the high predictive capability of financial behavior and improves the model's robustness. The results of this research paper strongly support the need to emphasize and enhance good financial behavior and financial trust to improve financial well-being among employed individuals.

Keywords: Financial well-being, financial literacy, financial stress, financial behaviour, financial attitude, financial trust

Paper Id: A234

ANALYSING THE PROPERTIES OF COMPRESSED PLASTIC AGGREGATES.

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Abstract

The increasing accumulation of plastic waste has become a major environmental concern worldwide, necessitating sustainable approaches for its effective utilization. This study focuses on developing an innovative concrete mixture by partially replacing conventional coarse aggregate with treated plastic waste in M30 grade concrete. The treated plastic waste, primarily consisting of polyethylene (PE) and polypropylene (PP), is processed through shredding, melting, and moulding before incorporation into the concrete matrix.

The experimental program investigates the effect of replacing coarse aggregate with an optimum percentage of treated plastic waste on the mechanical properties of concrete. Specimens were prepared and tested after 28 days of curing to evaluate durability parameters. The primary objective is to assess the feasibility of using treated plastic waste in structural concrete while maintaining adequate strength and durability.

Results indicate that the modified concrete exhibits a reduced density of about 1230 kg/m³, producing lightweight concrete with satisfactory compressive strength. Improved thermal resistance and durability characteristics were also observed. This study demonstrates a sustainable solution for concrete production and effective plastic waste management. The findings highlight the potential for integrating recycled plastic materials into construction practices to support sustainable infrastructure development.

Keywords: Plastic waste concrete, M30 grade concrete, Polyethylene, Polypropylene, durability, Lightweight concrete, Sustainable construction.

Paper Id: A235

Design and Optimization of a Compact Complementary Split Ring Resonator (CSRR) for 5G bands

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ABSTRACT

The rapid development of modern wireless communication systems such as 5G, Internet of Things (IoT), and wireless sensor networks has created a strong demand for compact and efficient electromagnetic structures. Conventional Complementary Split Ring Resonator (CSRR) based designs often suffer from larger physical size, limited absorption bands, and reduced performance at high frequencies. To overcome these limitations, this work proposes a compact Complementary Split Ring Resonator (CSRR) unit cell optimized for multi-band operation in high-frequency bands. The proposed CSRR structure is designed with a compact dimension of $15 \times 15 \times 1.575 \text{ mm}^3$ and operates efficiently at 8 GHz, 9 GHz, and 12 GHz, covering the X and Ku bands. The design is simulated using Ansys HFSS to analyze electromagnetic characteristics such as return loss, gain, VSWR, and radiation efficiency. The results show that the proposed structure achieves an improved return loss of approximately – 22 dB and an enhanced gain of 5.1 dBi, which indicates better impedance matching and higher radiation performance compared to conventional designs. In addition, the symmetric geometry of the CSRR provides polarization-insensitive behaviour and stable performance across different angles of incidence. Due to its compact size, high absorption efficiency, and multi-band capability, the proposed CSRR structure is suitable for 5G communication systems, IoT devices, wireless sensor networks, and ambient RF energy harvesting applications.

Keywords: CSRR, Metamaterial, 5G Communication, HFSS, RF Energy Harvesting

Paper Id: A236

Omni-Shield: An Autonomous Cross-Platform Immune System for Modern Scams

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Abstract

The rapid evolution of digital communication has inadvertently fostered a fertile landscape for sophisticated scams, leading to a critical "Trust Exploitation Crisis". Current digital defense mechanisms are fundamentally limited by their reactive nature, relying heavily on manual reporting and centralized keyword filtering. This dependency creates a significant "Latency Gap"—a window of vulnerability where new scams propagate unchecked before traditional systems can respond, resulting in widespread financial loss and eroded user confidence. To address this, we present Omni-Shield, an innovative, decentralized security framework that operates as a proactive immune system for digital communication. Unlike traditional filters, Omni-Shield utilizes on-device Agentic AI to conduct intent-based analysis rather than simple pattern matching. By interpreting behavioral patterns and contextual nuances locally, the system can autonomously identify and flag potential threats in real-time, effectively minimizing the latency gap. The core architecture of Omni-Shield integrates Edge Computing and Blockchain technology to ensure both privacy and global scalability. All analysis occurs locally on the user's device, ensuring personal content remains private. When a threat is detected, a unique, anonymous cryptographic hash—termed "Message DNA"—is broadcast to a decentralized global ledger. This triggers an immediate, network-wide "vaccination" effect, where all connected devices are instantly updated with the new threat signature, providing global immunization from a single point of detection. Our vision for Omni-Shield is to fundamentally shift the paradigm of digital security from passive reporting to active, self-healing immunity. By establishing a unified, autonomous shield across all communication channels—including WhatsApp, Gmail, and SMS—we aim to restore trust in interconnected lives and render modern scams ineffective through collective, decentralized intelligence.

Keywords: Agentic AI, Blockchain, Edge Computing, Digital Scams, Proactive Defense, Cybersecurity, Decentralized Immunity.

Paper Id: A237

INTELLIGENT THREAT ANALYSIS AND RISK PRIORILIZATION FOR SECURE WEB SYSTEM

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Abstract

Web applications play a vital role in modern digital platforms, but their rapid growth has increased exposure to cyber threats, leading to data breaches, financial losses, and compromised system integrity. Ensuring strong web security has therefore become essential. This paper presents a machine learning-based framework for intelligent threat analysis and risk prioritization in secure web systems. The proposed system detects and classifies multiple web attacks, including SQL Injection, Cross-Site Scripting (XSS), Brute Force Login attempts, Directory Traversal, Command Injection, Cross-Site Request Forgery (CSRF), and Denial-of-Service (DoS). It continuously monitors HTTP requests and extracts key security features such as request length, special character frequency, login patterns, script presence, SQL keywords, traversal indicators, command symbols, and request rate. These features are used to train an XGBoost classification model, chosen for its high accuracy, resistance to overfitting, and effectiveness in multi-class classification. The system also includes a chatbot-based interface that allows users to simulate and analyze attacks in real time, providing immediate feedback on request behavior. Experimental results show that the model achieves reliable performance across multiple attack types, demonstrating its effectiveness in real-time threat detection. This study highlights the potential of integrating machine learning with interactive systems to build scalable and intelligent web security solutions.

Keywords: Web Security, Machine Learning, XGBoost, Cyber Threat Detection, Risk Prioritization, Chatbot Interface.

Paper Id: A238

AI-BASED VIRTUAL DOCTOR USING MULTIMODAL LLMs FOR SYMPTOM ANALYSIS

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Abstract

The rapid advancement of Artificial Intelligence (AI) and Large Language Models (LLMs) has enabled the development of intelligent healthcare systems capable of assisting users in preliminary medical diagnosis and decision support. However, traditional healthcare systems often face challenges such as delayed medical consultation, limited accessibility to doctors, and difficulty in interpreting medical reports or symptoms without expert guidance. This paper presents an AI-Based Virtual Doctor Using Multimodal LLMs for Symptom Analysis. The system allows users to input symptoms in text form and uploads medical reports or images for analysis. Natural Language Processing (NLP) techniques are used to interpret symptom descriptions, while Optical Character Recognition (OCR) extracts data from medical documents. The proposed system employs artificial intelligence to generate disease predictions with associated probability scores, enabling accurate risk stratification. Based on the assessed risk, the system recommends appropriate medical specialists and facilitates automated appointment scheduling. This integrated approach prioritizes high-risk patients, thereby reducing waiting times, improving timely access to care, and optimizing healthcare resource utilization. The proposed model improves healthcare accessibility, supports early disease detection, and enhances decision-making through intelligent multimodal analysis.

Keywords: Artificial Intelligence, Multimodal LLM, Symptom Analysis, Healthcare AI, NLP, OCR, Disease Prediction, Risk Stratification, Automated Appointment Scheduling, Early Disease Detection

Paper ID: A239

SMARTOKR: MNC-STYLE OBJECTIVE AND KEY RESULT MANAGEMENT SYSTEM FOR STARTUP PERFORMANCE OPTIMIZATION

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Abstract

Startups often encounter significant challenges in managing performance as they scale, due to the lack of structured goal-setting and tracking mechanisms. Traditional task-based management systems focus primarily on activity completion rather than measurable outcomes, resulting in poor alignment, reduced transparency, and inefficient resource utilization. To address these limitations, this paper presents **SmartOKR**, a structured Objective and Key Result (OKR) management system designed specifically for startup environments.

The proposed system enables organizations to define clear objectives and measurable key results while ensuring alignment across teams through a centralized platform. SmartOKR incorporates features such as role-based access control, real-time progress tracking, automated performance computation, and interactive dashboards for visualization. These features collectively support data-driven decision-making and enhance accountability at both individual and organizational levels.

The system is implemented as a scalable web-based application and evaluated in a simulated startup environment. Experimental results indicate a tracking accuracy of 92% and an efficiency improvement of 88%, demonstrating significant reductions in time and resource wastage. Furthermore, the system improves team coordination, goal clarity, and employee engagement by linking individual contributions to overall organizational objectives.

In conclusion, SmartOKR provides a lightweight, scalable, and effective framework that bridges the gap between startup flexibility and enterprise-level performance management. Future work includes integrating artificial intelligence for predictive analytics, automated goal recommendations, and cross-platform deployment.

Keywords: Objective and Key Results (OKR), Startup Performance, Goal Tracking, Performance Management System, Real-Time Analytics, Team Alignment, Productivity Optimization.

Paper Id: A240

SMART CLOUD LOG MONITORING ALERT SYSTEM

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Abstract

Cloud computing environments generate a massive amount of system and application logs that contain critical information about system activities, errors, security threats, and performance metrics. Monitoring these logs manually is difficult and time consuming, especially in large-scale distributed cloud infrastructures. This paper presents a Smart Cloud Log Monitoring and Alert System that automatically collects, processes, and analyzes log data from cloud based servers and applications. The system uses automated log parsing techniques to identify system errors, suspicious activities, and abnormal patterns in real time. When an issue is detected, the system immediately sends alerts to system administrators through notification mechanisms such as email or dashboards. The proposed system provides centralized log management, automated anomaly detection, and real-time alerting to improve system reliability, security, and operational efficiency. The results show that the proposed system significantly reduces manual monitoring effort and improves the response time to system failures. The system provides centralized log management, automated anomaly detection, and real-time alerting capabilities that enhance system reliability, security, and operational efficiency. Experimental evaluation demonstrates that the proposed system significantly reduces manual monitoring effort and improves the response time to system failures in cloud environments.

Keywords: Cloud Computing, Log Monitoring, Alert System, System Monitoring, Anomaly Detection.

Paper Id: A241**Cost-Optimal Allocation of E-Waste Processing Capacity
in India Using Linear Programming****Abstract**

India's rapidly growing consumption of electrical and electronic equipment has led to a steady rise in e-waste generation, placing increasing pressure on formal recycling infrastructure. While national recycling targets continue to expand under Extended Producer Responsibility (EPR) regulations, the adequacy and spatial distribution of existing state-level processing capacity remain uncertain. This study develops a network-based optimization framework to evaluate the economic feasibility of achieving alternative national recycling targets using official government data. The objective is to minimize total system cost, incorporating both capacity expansion expenditure and infrastructure-weighted logistics routing costs, subject to national compliance and scalability constraints. The problem is formulated as a linear programming model with endogenous selection of five regional processing hubs. State-wise processing data and recycler density information are used to construct capacity, cost, and logistics impedance parameters. The model is solved using the HiGHS linear programming solver in Python. Results indicate that existing infrastructure is sufficient to meet moderate recycling targets without additional investment; however, once compliance exceeds approximately 60% of national generation, expansion and regional concentration become necessary, leading to accelerated cost escalation. The findings provide quantitative guidance for aligning environmental ambition with infrastructure readiness and regional reverse logistics design in India's formal e-waste management system.

Keywords: E-waste recycling optimization, Capacity expansion planning, Sustainable waste management, Linear programming, India

Paper Id: A242

Emotional Readiness as an Algorithmic Advantage: An AI-Driven Analytical Framework for Digital Recruitment Systems

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Abstract

. The rising trend of artificial intelligence in the recruitment process has brought a paradigm shift in the manner of recruiting, which in turn has sparked critical discussions about employability, equity, and career readiness. The research paper focuses on MBA students' insights about the influence of AI based recruitment software on employability confidence in the business industry. The research follows a quantitative cross- sectional study to collect data from 109 MBA students via a research questionnaire. The research combines age-old statistical analysis with machine learning to interpret findings about the impact of AI awareness, fairness, skill displacement, and AI anxiety and optimism on employability confidence. The analysis techniques employed in this research are correlation analysis, Decision Tree, Random Forest Analysis, K Means Analysis, as well as moderation analysis, which are carried out in Google Colab in Python. The result shows that anxiety and optimism towards AI is a more prominent predictor of confidence in employability than awareness and skill readiness, and awareness of AI is a more prominent predictor of confidence in employability than skill readiness. Business school and HR integration practices demonstrate a strong positive effect on awareness and confidence in employability as well as awareness and confidence in employability among students.

Keywords: Artificial Intelligence; AI-Driven Recruitment; Employability Confidence; MBA Students; Machine Learning; HR Integration Practice.

Paper Id: A243

HYBRID EXTENDED KALMAN FILTER & MACHINE LEARNING APPROACH FOR SOC -SOH ESTIMATION IN SODIUM ION BATTERIES

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ABSTRACT :

Accurate estimation of internal battery states , particularly state of charge (SOC) and state of health (SOH) , remains a central requirement for reliable battery management in emerging sodium -ion battery systems . While sodium -ion chemistry offers clear advantage's in terms of material abundance and cost , its electrochemical behavior introduces Unique's challenges for conventional estimation techniques , including reduced voltage sensitivity over extended SOC regions and pronounced temperature-dependent resistance variations . This paper presents a hybrid estimation framework that combines a physics -based Extended Kalman Filter (EKF) with a lightweight neural network designed to compensate for model inaccuracies .The EKF operates on a three -RC equivalent circuit model tailored to capture the dynamic behaviour of hard carbon sodium -ion cells , while the neural network utilizes internal filter signals -particularly the voltage innovation to learn residual error patterns arising from parameter drift , temperature mismatch and non linear electrochemical effects .In addition SOH evolution is modelled using an Arrhenius -based degradation formulation , supported by an innovation -driven correction mechanism that links long -term estimation trends with aging behaviour .The proposed framework is evaluated under varying temperature and dynamic current profiles over an extended aging horizon . Results indicate significant improvements in estimation accuracy compared to standalone EKF and purely data -driven methods , while maintaining low computational complexity suitable for embedded battery management systems .

KEYWORDS : Sodium -ion batteries , Hybrid EKF , ANN , Three RC equivalent circuit , State of charge (SOC).

Paper Id - A244

Cyber Security: Authentication and Authorization

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Abstract

Cyber security has become very important in today's digital world because many systems and services depend on the internet. Organizations store a large amount of sensitive information such as personal data, financial records, and confidential documents in online systems. If proper security measures are not implemented, this information can be accessed or misused by unauthorized users. Authentication and authorization are two important security mechanisms that help protect these systems. Authentication refers to the method of confirming a user's identity before granting entry to a system. Authorization, on the other hand, defines the permissions and activities that an authenticated user is allowed to carry out. Together, these two security processes ensure that access to resources is limited to appropriate and approved users only. In the absence of strong authentication and authorization controls, systems are exposed to potential cyber threats, unauthorized access, and data security risks. This research focuses on understanding the role of authentication and authorization in cyber security and how these mechanisms help protect modern applications. The study also discusses common techniques such as password hashing, token-based authentication, and role-based access control. Secure password storage methods like hashing and salting are used to protect user credentials, while token-based authentication methods such as JSON Web Token (JWT) help manage user sessions securely. The study highlights the importance of implementing strong authentication and authorization strategies to prevent unauthorized access. By using proper security practices and access control mechanisms, organizations can significantly reduce security risks and protect sensitive data.

Keywords: Cyber Security, Authentication, Authorization, Password Hashing, Salt, JWT, RBAC, Web Security.

Paper Id: A245

Federated Learning-Based Crop Disease Diagnosis Framework Using IoT-Enabled Field Cameras and Distributed Farm-Level Data for Privacy-Preserving Smart Agriculture

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Abstract

Agriculture is a crucial aspect for food production. However, crop diseases have a great impact on crop yield and the income of the farmer. In the existing AI-based crop disease detection systems, data is used centrally, which may lead to security issues. Therefore, a Federated Learning-based Crop Disease Diagnosis Framework using IoT-based field cameras is proposed. In this framework, the crop images will be taken at the field level, and the model will be trained locally without using the data centrally. Only the updated models will be sent to the server. This will ensure the security and privacy of the data. This framework will be efficient, scalable, and secure, which makes it more applicable for real-time usage. In the future, IoT devices and mobile applications will also be added.

Keywords: Federated Learning ,Crop Disease Detection, Smart Agriculture, IoT, Data Privacy

Paper Id: A246

Adaptive Energy-Aware UAV-Mounted RIS Architecture for Intelligent Spectrum Discovery in Cognitive Radio Sensor Networks

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Abstract

Cognitive Radio Sensor Networks (CRSN) enable sensor nodes to use available channels dynamically, which helps make better use of the spectrum. However, traditional methods of assigning channels consume a lot of energy and don't adapt well to changing conditions. Ozger's earlier work in 2021 focused on making communication more energy-efficient but relied on fixed decision-making methods. This paper introduces an AI-based model for allocating channels that uses smart decision-making to choose the best channels adaptively. The system uses learning that considers energy use to improve how nodes communicate and reduce unnecessary transmissions. Simulations conducted in MATLAB show that this new method improves how long the network can operate, uses less energy, and makes better use of the spectrum compared to older systems. The results show that using AI for channel allocation greatly improves the performance of CRSN and offers a scalable solution for future wireless sensor networks.

Keywords: Cognitive Radio Sensor Networks (CRSN), Spectrum Allocation, Artificial Intelligence, Energy Efficiency, Dynamic Spectrum Access, Wireless Sensor Networks, MATLAB Simulation.

Paper Id: A247

A Deeplearning Approach for Emotion Recognition Using EEG Signals

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Abstract

The Analysis of emotional states through Electroencephalography (EEG) continues to be a crucial challenge in the advancement of reliable Brain-Computer Interfaces (BCI). Although modern studies often emphasize simplified binary or quadrant emotion frameworks, this research introduces a deep learning system for the detailed classification of 27 distinct emotional states. Using a 14-channel EEG setup and the Interactive Frequency Network (IFNet) framework, we employ a tailored preprocessing pipeline that includes 50Hz notch filtering and linear detrending to address non-stationary signal artifacts. The suggested model investigates 256-sample temporal segments to obtain cross-channel frequency relationships. Experimental findings show that the IFNet-CNN method achieves greater stability and prediction accuracy than conventional Support Vector Machine (SVM) benchmarks, presenting a scalable option for real-time affective computing.

Keywords: IFNet-CNN, Electroencephalography(EEG), Emotion Recognition, Affective Computing, Deep Learning .

Paper Id: A248

Image-Based Rice Leaf Disease Detection System

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Abstract

In this paper, Rice is one of the most important staple crops worldwide, serving as a primary food source for more than half of the global population. However, rice production is significantly affected by various leaf diseases, leading to yield losses of up to 20–40%. Early and accurate identification of these diseases is essential to minimize crop damage. Manual inspection by farmers is time-consuming and often inaccurate, especially for large-scale agricultural fields. This paper proposes a transfer learning-based approach using the CNN VGG19 architecture for automated rice leaf disease detection and classification. The model analyzes leaf images to extract discriminative features and classify them into four categories: healthy, leaf blast, brown spot, and bacterial leaf blight. The pre-trained VGG19 model is fine tuned to improve classification performance and generalization. The developed model provides a reliable, efficient, and cost-effective solution for supporting smart agricultural practices and reducing crop losses.

Keywords: Rice Disease Detection, CNN, VGG19, Transfer Learning, Image Classification.

Paper Id: A249

ASSESSING THE ROLE OF PRE-PURCHASE SUPPORT AND POST-PURCHASE SERVICE IN CUSTOMER RETENTION AT HYDERABAD

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ABSTRACT

The retail and service sectors in India have become highly competitive, where customer retention depends not only on product quality but also on the overall service experience across the customer journey. This study examines the role of pre-purchase support and post-purchase service in influencing customer retention in Hyderabad. The research focuses on customer perceptions regarding pre-purchase assistance, clarity of information, service guidance, after-sales service, maintenance support, and complaint handling. A sample of 200 customers was selected using random sampling techniques. Data were collected through a structured questionnaire and analyzed using percentage analysis. The findings indicate that while customers generally appreciate pre-purchase support and post-purchase services, gaps remain in service responsiveness and grievance redressal. The study provides insights for retailers and service providers to enhance customer retention through improved service practices.

Keywords:

Pre-purchase support, Post-purchase service, Customer retention, Service quality, Hyderabad

Paper Id: A250

Driver Drowsiness and Alcohol Detection & accident prevention System

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Abstract

Road accidents are increasing every year, and a large number of them happen because of driver drowsiness, drunk driving, and late accident response. Many drivers feel sleepy while driving or consume alcohol, which reduces their ability to control the vehicle properly. Also, when an accident happens and help does not reach on time, the chances of serious injury become higher. Therefore, there is a strong need for a smart system that can detect these problems early and prevent accidents. This project presents an IoT-based Driver Drowsiness and Alcohol Detection & Accident Prevention System. The system uses different sensors connected to an Arduino UNO and NodeMCU to monitor the driver and vehicle in real time. An IR eye-blink sensor is used to check whether the driver is feeling sleepy. If the driver's eyes remain closed for more than a few seconds, the system identifies drowsiness and immediately slows down the vehicle and rings a buzzer to alert the driver. An MQ-3 alcohol sensor is used to detect alcohol in the driver's breath. If alcohol is found, a warning LED glows, and the vehicle speed is reduced to prevent unsafe driving. For accident prevention, an accelerometer sensor (ADXL345) is used. It senses sudden jerks, collisions, or abnormal movement. When an accident occurs, the system automatically controls the brakes and activates a safety bumper to reduce impact. Along with this, a GPS module takes the live location of the vehicle. The NodeMCU sends this information to emergency contacts through IoT, so help can reach the accident spot quickly. The prototype works effectively and shows good accuracy in detecting drowsiness, alcohol presence, and accidents. By combining all these safety features in one low-cost system, this project helps reduce accidents caused by human errors and improves road safety. It can be easily installed in vehicles and has the potential to save many lives by providing timely alerts and quick emergency response.

Keywords: Driver Drowsiness, Alcohol Detection, Accident Prevention, IoT, Arduino, Sensors

Paper ID: A251

WhatsApp-Based Conversational Triage and Doctor Recommendation: A Low-Resource Healthcare Model for Nagaland, India.

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Abstract:

Navigating healthcare systems continues to be a challenging in low-resource and geographically limited regions where clinical infrastructures are constrained. In traditional hospital workflows, receptionists hold a crucial role in leading patients to the correct doctor depending on the descriptions of the symptoms by the patient. However, such triage guidance is almost universally unavailable before patients arrive at the healthcare facilities. This paper describes a WhatsApp conversational Artificial Intelligence framework as a pre-hospital digital receptionist. it performs a symptom-to-specialty triage, along with doctor recommendations without trying to diagnose. To bridge between the structured mode of clinical terminology and informal mode of communication from patients, we use a hybrid data augmentation pipeline of conversational approach, to train a natural language processing classifier for the prediction of specialty. For the recommendation engine we are collecting a localized, real-world dataset of medical practitioners across Nagaland for this study. The customization of this regional database directly addresses this severe gap in access to information about healthcare providers in Nagaland and addresses the issue with strict methods to maintain professional privacy and data security. The critical routing features included in a dataset are standardized specialties, professional experience, hospital affiliations, and accurate geospatial coordinates. An Adaptive Triage Routing Algorithm (ATRA) evaluates patient queries and predicts the best three medical specialties, ensuring safer patient routing in ambiguous situations. A geospatial recommendation engine then ranks available regional physicians according to a normalized scoring matrix related to closeness, experience and relevance of the physician specialty. By utilizing a carefully maintained, regional curated dataset rather than generalized web data, the proposed framework minimizes clinical risk while providing accessible localized healthcare navigation through a ubiquitous messaging platform. The framework demonstrates the potential of deploying highly constrained, region-specific recommendation systems to play the triage role of hospital receptionists in underserved areas.

Keywords: Conversational AI, Healthcare Navigation, Natural Language Processing, Triage Routing, Recommender Systems, Geospatial Analysis, Low-Resource Environments.

Paper Id: A252

Natural Language to 3D Automation: Integrating Large Language Models with Blender via Direct Socket Communication

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Abstract

This paper presents a natural language interface for Blender's bpy API, enabling users without programming backgrounds to generate 3D content through plain English prompts. The system addresses the accessibility barrier posed by the bpy API by integrating a Flask backend, a language model, and a custom Blender addon communicating via a TCP socket at localhost:9876. User input is enriched, validated through a two-layer safety filter using regex pattern matching and AST parsing, then executed live in the Blender viewport—achieving a full pipeline latency of 1.2 seconds for simple scenes. Evaluated across 50 prompts, 5 scene types, and 15 users, the system achieved an 86% execution success rate, a 71% reduction in modeling time, and positive experience ratings from 78% of first-time bpy users. The safety filter blocked 100% of adversarial inputs with zero false positives. Prompt engineering was identified as the key quality factor, improving success from 62% to 86% and Blender 4.0 API compatibility by 37 percentage points. The interface features a plain HTML/JavaScript frontend with a CodeMirror code viewer and Design Module presets. Results confirm that direct LLM-to-3D-tool socket integration is both practical and effective without reliance on third-party platforms.

Keywords—Natural Language Processing, Blender bpy, TCP Socket Automation, LLM, Flask Backend, 3D Procedural Generation, Prompt Engineering, LLM Code Generation, Design Module Presets, CodeMirror UI

Paper Id: A253

Analytical Investigation on Self-Compacted Short Panelled Concrete Pavement Slabs Using Finite Element Modeling (FEM)

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Abstract

The study analyses numerically the effect of various parameters on the design characteristics of Self-Compacted Short Panelled Concrete Pavement Slabs having size ranging from 0.5 m×0.5 m to 2 m×2 m. The study also includes a comparative analysis between the effect of traffic loading using 3-D FEM. Results indicated FEM yielded higher values of stresses and deflections as compared to 3-D FEM, particularly for lower thickness of slab of the order of 50 mm. Analysis of the results further shows that increase in slab thickness from 50 to 200 mm causes considerable reduction in flexural stresses, while the reduction in deflection was moderate. The load transfer between slabs is through aggregate interlock joints. As the panel size increases from 0.5 m×0.5 m to 2 m×2 m for any given thickness of slab, stress increases significantly, while the deflection reduces. It was found that variation in the effective modulus of subgrade reaction (k-value) does not have appreciable effect on variation of stresses in the slab, whereas the deflection in the slab varies significantly. Results from 3-D FEM on short-panelled pavements indicated that wheel load stresses in combination with loading yields higher values of flexural stresses as compared to traffic loading alone. A panel size of 1.0–1.5 m having pavement thickness of 150–200 mm was found to be optimum. The above panel size and thickness the values of maximum flexural stresses which is safe for M40 grade concrete, generally employed for pavement quality concrete.

Keywords: Self-Compacted Concrete, Short Panelled Pavement slabs, FEM, Wheel load stresses, Flexural stresses.

Paper Id: A254

Privacy-Preserving lung cancer detection using Federated learning with a VGG16 Model

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Abstract

Lung cancer is one of the leading causes of cancer-related deaths worldwide, making early detection crucial for improving patient survival rates. Computed Tomography (CT) imaging is widely used for lung cancer diagnosis; however, manual interpretation of CT scans relies heavily on radiologist expertise and can be time-consuming. In addition, centralized training of medical imaging data raises significant privacy concerns in healthcare systems. To address these challenges, this study proposes a hybrid federated learning framework for lung cancer classification using a deep learning model based on VGG16. In the proposed approach, a global server initializes the model and distributes trained weights to multiple clients, where local training is performed using decentralized CT scan data. The updated model parameters from each client are then aggregated at the server using the Federated Averaging algorithm to construct an improved global model without sharing sensitive patient data. The system classifies CT images into three categories: Benign, Malignant, and Normal. Experimental results demonstrate that the proposed framework achieves a global classification accuracy of 92% while maintaining data privacy. The proposed approach enhances model generalization, improves diagnostic efficiency, and serves as a clinical decision-support system to assist radiologists in distributed healthcare environment.

Keywords — Lung Cancer Detection, Federated Learning, VGG16, Medical Image Analysis, Privacy Preservation

Paper Id: A255

Explainable Machine Learning for Regional Language Fake News Detection: English, Hindi, and Kannada

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Abstract

This study proposes an effective multilingual fake news detection system that is particularly suited to the culturally rich and linguistically varied environment of India, with special emphasis on the languages of English, Hindi, and Kannada. The system relies on the comparative modeling technique to test the performance of the Multinomial Naive Bayes and Support Vector Machine algorithms. After comprehensive evaluation of the system based on key performance indicators, the SVM algorithm was found to be more accurate in terms of validation and was selected as the final system. The TF-IDF vectorization technique was used to optimize the feature extraction process, which is highly effective in identifying significant patterns that make fake news different from real news. An important aspect of this study is the incorporation of Explainable AI technology to overcome the limitations of the black box nature of the system. Word-level highlighting was used to provide visual transparency to the system. Currently, the system is operational through a Command-Line Interface (CLI), allowing for real-time content analysis and feedback. The results of this study clearly demonstrate the effectiveness of traditional machine learning algorithms, with the addition of XAI, as a highly effective solution to combat misinformation in multicultural environments. Future studies will aim to extend the framework to incorporate other regional languages and deep learning architectures to accommodate the increasingly complex nature of the data.

Keywords: Multilingual fake news detection, Support Vector Machine, Multinomial Naive Bayes, TF-IDF vectorization, Explainable AI, Natural Language Processing

Paper Id: A256

Design of an ESP32-Based Real-Time Electrical Fire and Gas Protection System for Industrial Testing Environments

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Abstract

Industrial fire hazards caused by electrical faults and gas leakage pose serious risks to equipment and human safety. This paper presents the design and experimental validation of an IoT-based electrical fire and gas protection system using an ESP32 microcontroller for industrial environments. The proposed system integrates a ZMPT101B voltage sensor and an ACS712 current sensor for electrical parameter monitoring, along with MQ-2 and MQ-135/MQ-9 sensors for smoke and hazardous gas detection. The ESP32 processes sensor data in real time and compares the measured values with predefined safety thresholds to detect abnormal conditions. When hazardous conditions such as gas leakage, overcurrent, or abnormal voltage are detected, the system automatically disconnects the power supply using a relay module and activates local alarms. In addition, the ESP32 transmits real-time sensor data to an IoT cloud platform for remote monitoring. Experimental results demonstrate accurate electrical parameter measurement, rapid fault detection, and reliable system performance. The proposed system provides a low-cost and scalable solution for industrial safety monitoring.

Keywords — ESP32, IoT Monitoring, Fire Detection, Gas Leakage Detection, Industrial Safety, Smart Protection System

Paper Id: A257

Hybrid Sensor Fusion System for Vehicle Accident Avoidance and Emergency Response Optimization

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Abstract

Road accidents remain one of the leading causes of injuries and deaths worldwide, mainly due to drunk driving, driver fatigue, poor visibility, and delayed emergency response. This project presents an Integrated Smart Vehicle Safety and Accident Prevention System developed using a microcontroller-based platform to enhance road safety through real-time monitoring and automated control. The system combines five major safety modules: alcohol detection, driver drowsiness detection, accident detection with GPS-based alert, child safety mechanism and fog detection with distance measurement. When alcohol is detected, the vehicle ignition is automatically disabled to prevent drunk driving. If the driver's eyes remain closed for more than three seconds, the system activates rear parking lights and gradually slows down and stops the vehicle. In case of an accident, a vibration sensor detects the impact and automatically sends an alert message and makes a call to nearby control centres and relatives along with the exact GPS location. For child safety, a respiratory sensor detects breathing inside a locked vehicle and automatically unlocks the door using a servo motor. During fog conditions, a fog sensor activates a laser light to improve visibility and an ultrasonic sensor displays obstacle distance on the LCD screen. This integrated system provides a cost-effective, reliable, and proactive solution to prevent accidents and ensure rapid emergency response.

Keywords: Smart Vehicle Safety, Accident Detection, Alcohol Sensor, Drowsiness Monitoring, GPS Tracking, Child Safety, Fog Detection, Embedded Systems.

Paper Id: A258

An Innovative Intrusion Detection Framework for FDIA in Smart Power Grid Systems

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Abstract

The rapid advancement of smart power grid technologies has significantly improved energy monitoring, automation, and operational efficiency; however, it has also introduced cybersecurity vulnerabilities such as False Data Injection Attacks (FDIA), where attackers manipulate sensor measurements to disrupt system operations while bypassing traditional detection methods. Detecting such attacks is challenging due to the dynamic and time-dependent nature of power system data. This paper proposes an intrusion detection framework using a MAMO-optimized CNN-LSTM model for effective FDIA detection. The CNN component extracts spatial features from electrical parameters such as voltage, current, power, and frequency, while the LSTM network captures temporal dependencies in time-series data. The Multi-Adaptive Metaheuristic Optimization (MAMO) technique enhances model performance by optimizing parameters and improving training convergence. The proposed system efficiently identifies abnormal patterns and strengthens the security, reliability, and resilience of modern smart grid systems.

Keywords: FDIA, Smart Grid Security, CNN-LSTM, Deep Learning, Mamo Optimization

Paper Id: A259

Application of IoT in Metal Casting Furnace

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Abstract

Metal casting furnaces are essential equipment in foundry industries for melting metals and maintaining the required temperature to produce high-quality cast components. In conventional furnace systems, monitoring of furnace conditions is mostly performed manually. Important parameters such as furnace temperature and melting status are checked at intervals, which can result in delayed detection of abnormalities and reduced process efficiency. This project presents the application of Internet of Things (IoT) technology for real-time monitoring of a metal casting furnace, aiming to enhance process visibility and operational control. In the proposed system, furnace operating data is continuously collected and transmitted through an IoT communication network to a centralized platform. The data is then processed and displayed on a digital dashboard, enabling operators to monitor furnace conditions in real-time and identify any unusual variations during the melting process. The implementation of the IoT-based monitoring system enhances process supervision, supports faster decision-making, and improves safety in foundry operations. By transforming traditional furnace monitoring into a connected and data-driven approach, the system enhances production efficiency and ensures consistent casting quality in modern industrial environments.

Keywords: Internet of Things (IoT), Metal Casting Furnace, Real-Time Monitoring

Paper Id: A260

ENTROPY - MODULARITY DUALITY IN SELF-SIMILAR GRAPHS

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Abstract

Self-similar graphs have recursive patterns in their structure that lead to multi-scale organization and power-law scaling. Although entropy is a measure of distributional uncertainty and modularity is a measure of structural cohesion compared to a null model, the underlying connection between the two in fractal graphs is still a theoretically open question. This paper formalizes a duality principle between entropy and modularity in self-similar graphs. The total structural entropy of a system decomposes into three components, which are intra-community entropy (H_{intra}) and inter-community entropy (H_{inter}) and mutual information (I_C) based on their information-theoretic properties. The research presents a new fractal modularity measurement Q_f^{IT} which uses scaling corrections to resolve the problems that classical modularity faces during recursive renormalization. The duality theorem demonstrates that self-similar scaling graphs comply with the following equation $Q_f^{(t)} \exp(-\gamma H^{(t)}) = K$. The value of γ which reflects the fractal dimension shows that modularity maximization results in the reduction of structural redundancy. The derivation of a conservation law demonstrates that the scaling exponents of modularity (α) and entropy (β) satisfy the equation $\alpha + \beta = 1$ when applied to self-similar graphs of large scale. The duality gap $D = 1 - (\alpha + \beta)$ serves as a quantitative metric that evaluates how much something deviates from its self-similar state. The framework is validated through analytical calculations on balanced binary/ternary trees and Sierpiński graphs (which obey the duality), and unbalanced trees (which exhibit significant duality gaps). This research combines information theory with community detection methods to show that entropy quantifies distribution while modularity measures how recursive patterns in hierarchical networks become compressed.

Keywords: Entropy-Modularity Duality, Self-Similar Graphs, Information-theoretic Modularity, Duality Principle, Shannon entropy, and Information Dimension.

Paper Id: A261

Brain Tumor Detection Using Deep Learning on MRI Images

Abstract:

Brain tumors are among the most critical neurological disorders and require early and accurate diagnosis to improve patient survival rates. Magnetic Resonance Imaging (MRI) is widely used for brain tumor diagnosis due to its high contrast resolution and non-invasive nature. However, manual interpretation of MRI scans by radiologists is time-consuming and prone to subjective errors. To address this challenge, this project proposes a deep learning–based approach for automated brain tumor detection using MRI images. The proposed system employs a Convolutional Neural Network (CNN) to classify MRI images into tumor and non-tumor categories. CNNs are highly effective in image analysis as they automatically learn hierarchical features from raw image data without the need for manual feature extraction. The MRI images are preprocessed through resizing, normalization, and data augmentation to enhance model performance and generalization. The trained model achieves high accuracy, demonstrating its capability to reliably detect brain tumors. This automated system can assist medical professionals by reducing diagnosis time, improving accuracy, and supporting early treatment planning. The results highlight the potential of deep learning techniques in medical image analysis and their role in enhancing computer-aided diagnostic systems.

Paper Id: A262

Adaptive Energy Flow Regulation and Multi-Mode Control Architecture for a Standalone Solar-Powered EV Charging Microstation with Integrated Battery Storage

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Abstract

The growing acceptance of electricity-powered vehicles (EVs) requires functional and reliable charging systems, especially in distant and grid-independent spots. In the paper, the design and nonlinear control of an off-grid EV charging station that combines photovoltaic arrays, DC to DC converters, a battery energy storage system (BESS), and more than one charging port are described. The presented strategy of nonlinear control manages the power flow between the solar source, battery, and EV loads in response to changes in irradiance and the load. Feedback of current and voltage transformers Real-time feedback at the DC bus improves stability and protection and voltage regulation. Intelligent mode choice allows the smooth switching of direct solar charging, battery-enabled charging and prioritized load treatment. Demonstration shows that simulation and experimental validation show better dynamic response, energy efficiency, and the trustworthy autonomous work of the technology. The system suggested can offer a feasible approach to sustainable charging of EVs in off-grid systems that are based on renewable energy.

Keywords: Solar Photovoltaic system, electric vehicle charging, nonlinear control, battery energy storage system, off-grid power system, maximum power point tracking, DC-DC converters.

Paper Id: A263

OPTIMIZATION OF POLICE PATROL ROUTES USING GRAPH THEORY: A STUDY OF KANCHIPURAM DISTRICT

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Abstract

This project models the road network of Kanchipuram District, Tamil Nadu using graph theory and applies shortest path algorithms to optimize patrol routes for police units. The goal is to reduce average response time and improve patrol coverage efficiency. The model incorporates real road connectivity, police station locations, and crime hotspots to compute optimal patrol paths. Performance comparisons and visualizations are presented to demonstrate improvements in routing efficiency.

Keywords: Graph theory, shortest path algorithms, Route optimization.

Paper Id: A264

**Graph-Based Optimization and Machine Learning
Assisted Power Grid Design for Solar Farm
Interconnection**

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ABSTRACT

Efficient interconnection of multiple solar farms to the utility grid is a significant challenge in modern renewable energy planning, as improper cable routing can increase installation costs, transmission losses, and network complexity; to address this, the paper proposes a graph-based optimization framework using Minimum Spanning Tree (MST) principles, where solar farms and the grid substation are modelled as nodes and transmission distances as weighted edges, with Prim's algorithm applied to obtain an optimal network minimizing total cable length; a hypothetical case study demonstrates that the MST-based design outperforms direct connection approaches by significantly reducing cable length and cost, while a simple machine learning component using a linear regression model—trained on features such as total cable length, number of interconnections, and average edge length—predicts transmission loss at approximately 2.5% for the optimized network, highlighting its usefulness for rapid early-stage estimation; additionally, Particle Swarm Optimization (PSO) is discussed as a potential extension for multi-objective optimization considering cost, losses, and reliability, thereby showing that the integration of graph-theoretic methods with basic machine learning provides a scalable, efficient, and intelligent solution for solar farm interconnection planning.

Keywords: Solar Farm Interconnection, Minimum Spanning Tree, Linear Regression, Renewable Energy, Cost Optimization

Paper Id: A265

DESIGN AND IMPLEMENTATION OF HIGH-PERFORMANCE 32-BIT ALU USING ADVANCED ARITHMETIC ARCHITECTURES ON XILINX SPARTAN-6 FPGA

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ABSTRACT

This paper presents the design and implementation of a high-performance 32-bit Arithmetic Logic Unit (ALU) on Xilinx Spartan-6 FPGA. Three different adder architectures are implemented and compared: a full 32-bit Kogge-Stone adder, a Carry Look-Ahead (CLA) adder, and a proposed hybrid Kogge-Stone adder with 4-stage pipelining. Each design integrates a common Radix-4 Booth multiplier and a logarithmic barrel shifter. The hybrid architecture combines fast FPGA carry chains for the lower 16 bits with parallel-prefix Kogge-Stone logic for the upper 16 bits, significantly reducing routing congestion and fan-out delays. A 3-stage pipelined Booth multiplier processes 2 bits per cycle, completing 32-bit multiplication in 16 iterations with improved throughput. The logarithmic barrel shifter decomposes shift amounts into powers of two, achieving $O(\log n)$ delay compared to $O(n)$ in conventional shifters. The complete ALU incorporates a 4-stage global pipeline that balances all computational paths. The proposed design achieves a maximum operating frequency of 125.6 MHz, representing a $5.7\times$ improvement over the non-pipelined Kogge-Stone implementation (22.0 MHz) and $3.06\times$ improvement over the Carry Look-Ahead design (41.1 MHz). The critical path is reduced from 45.445 ns in the original design to 7.959 ns register-to-register delay in the pipelined implementation. All designs are verified with comprehensive testbenches comprising 30 test cases covering addition, subtraction, multiplication, shift operations, and comparisons, achieving 100% functional correctness. Resource utilization for the proposed design is approximately 3500 LUTs and 450 flip-flops, with no DSP blocks required. The design is synthesized and implemented using Xilinx ISE Design Suite 14.7 targeting the xc6slx45-fgg484-2 device. This work demonstrates that proper pipelining and hybrid architecture optimization are more critical than adder topology alone for achieving high-performance arithmetic units on FPGA platforms.

Keywords: ALU, Kogge-Stone Adder, Carry Look-Ahead, Radix-4 Booth Multiplier, Barrel Shifter, FPGA, Pipelining, High-Performance Computing, Spartan-6, VLSI Design

Paper Id: A266

Circular Waste-to-Energy Approach: Peas Peel Biomass-Derived-ZnO Nanohybrid for enhanced and sustainable Hydrogen Evolution

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Abstract

A novel, cost-effective, and environmentally efficient waste *pea peel* (PP) biomass is synthesized via a one-step carbonization–activation process, integrating porous carbonaceous frameworks with ZnO nanoparticles for enhanced hydrogen (H_2) generation through photocatalytic water splitting. The porous carbonaceous matrix derived from PP acts as a conductive substrate and is preferentially oxidized, making the uphill water-splitting process thermodynamically more feasible and enhancing H_2 production. In this study, biomass obtained from waste PP (collected from household and market sources), characterized by low lignin content, is hybridized with ZnO to form a PP–ZnO nanohybrid. Morphological, optical, and structural characterizations of the synthesized PP–ZnO nanohybrid are carried out to evaluate its physicochemical properties. The H_2 generation performance of the PP–ZnO nanohybrid is assessed in the presence of water and a sacrificial agent under 1 sun irradiation for 6 hours. The study demonstrates a dual-functional PP–ZnO system that effectively combines waste biomass valorization with ZnO photocatalysis, enabling efficient, recyclable, and low-cost H_2 production. Under full-spectrum irradiation, PP–ZnO exhibits significantly enhanced H_2 generation (28.89 mmol g⁻¹ h⁻¹), which is nearly 4.2 times higher than pristine ZnO (6.85 mmol g⁻¹ h⁻¹). The improved performance is attributed to the synergistic effect of defect-mediated charge separation and enhanced electron transport through the porous carbon network, establishing PP–ZnO as a promising and environmentally sustainable photocatalyst for H_2 generation.

Keywords: Carbonaceous biomass, Hydrogen generation, Photocatalytic water splitting, Biomass oxidation.

Paper Id: A267

Smart Traffic Management System for Urban Congestion

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Abstract

Traffic congestion has become a major problem in urban areas due to the rapid increase in the number of vehicles and limited road Infrastructure. Traditional traffic signal systems generally operate on fixed time intervals without considering real-time traffic density on the roads. This results in inefficient traffic management, longer waiting times at intersections, higher fuel consumption, and increased air pollution. In addition, existing traffic systems do not provide priority for emergency vehicles such as ambulances, fire trucks, and police vehicles, which can lead to delays during critical situations. To address these issues, a Smart Traffic Management System with Emergency Vehicle Detection is proposed. The system uses technologies such as sensors, Microcontrollers, and communication modules to monitor and control traffic signals intelligently. Traffic density sensors like infrared (IR) Sensors, ultrasonic sensors, and cameras are used to detect the number of vehicles in each lane. The collected data is processed by a Microcontroller such as Arduino or Raspberry pi, which adjusts signal timing dynamically based on traffic conditions. The system also includes an emergency vehicle detection mechanism using RF modules, or siren detection sensors like acoustic sensors . When an emergency vehicle approaches the intersection, the system automatically changes the signal to green in that direction to provide a clear path, allowing the vehicle to pass quickly and safely. After the emergency vehicle passes, the signal returns to normal operation. This approach helps reduce traffic congestion, minimize waiting time, save fuel, and lower environmental pollution. Overall, the proposed smart traffic management system provides a cost-effective and efficient solution for improving traffic control and supporting faster emergency response in modern cities .

Keywords: Traffic Congestion Control, Emergency Vehicle Detection, Intelligent Traffic Signals, Traffic Density Monitoring.

Paper Id: A268

A Study on GST 2.0: Impact on Businesses and Consumers

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Abstract

The introduction of GST 2.0 in September 2025 has a significant effect and breakthrough in India's indirect tax system. The goal of this reform is to ease the present tax structure, reduce double taxation effects and improve economic efficiency through simplified slab rates of 5% and 18%. The shift in slab rates aims to make businesses operate easier by optimizing earlier tax rates across multiple sectors. Thus, the products and services are made available and affordable for the consumers, throughout the country. This study examines various policy changes introduced in the 56th GST Council meeting and evaluates their outcomes for both businesses and consumer base. The research adopts a descriptive and analytical approach using secondary data from GST Council meetings, various research publications and economic outlook studies. Comparative analysis is used to examine the shift from the pre and post GST 2.0 system. In addition, sector wise analysis is also included to understand the impact of change in rates on industries such as FMCG, healthcare , consumer durables and MSME's. The expert opinions and policy discussions from recent industry sources are also reviewed to provide a broader understanding of the reforms' practical effects.

The findings indicate that GST 2.0 has contributed to a clear understanding of laws and regulations for businesses by reducing technical difficulties and improving input tax credit flow. For MSME's, it has improved cash flow and has simplified the compliance procedures and processes, making the businesses operations easy. From the consumer perspective, the reduction of GST rates on essential goods, healthcare items, and certain consumer durables has increased affordability and improved purchasing power. Lower tax slab rates on automobiles, construction materials and everyday consumer products have also encouraged demand across many sectors.

Overall, this study concludes that GST 2.0 provides a progressive step towards the convenience and effectiveness of taxation atmosphere in India. Though the system offers advantages in terms of uniform and transparent tax rates, its long-term success depends on its effectiveness, digital infrastructure support for small enterprises, and continuous policy efforts for the expansion and growth of GST framework in all the sectors.

Keywords: GST 2.0, consumers, businesses, slab rates, MSME, rationalization.

Paper Id: A269

AI DRIVEN CRIME PATTERN DETECTION SYSTEM: HOME SAFETY

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Abstract

This is a project that seeks to design a smart home security surveillance system that employs artificial intelligence for improving security by automatically viewing and analyzing video content. The central aim is to minimize the need for continuous human observation while at the same time facilitating rapid responses to abnormal or criminal behavior. Computer vision is employed to examine live and stored video feeds. When it senses any unusual activity like theft, trespass, or vandalism, it securely stores the video and immediately alerts the concerned individual through SMS. One of the strongest aspects of this solution is its simple, login-protected dashboard. Using this dashboard, users are able to upload high-definition video files, see AI-generated detection outcomes, and view previously captured footage. This ensures that it is simple for homeowners to remain up-to-date and access any events that have taken place. The website utilizes Fast API for its backend, OpenCV for video frame processing, and Gemini AI for the detection of certain forms of suspicious behavior. MongoDB is applied to process data storage effectively, with Twilio being used for sending real-time SMS notifications. By integrating these technologies, the system provides a responsive and reliable security solution. It not only gives peace of mind to the users but also enables users to respond immediately in case of threats being detected. This project showcases the potential of AI to be used in real-life applications, particularly in domains such as home security where early detection and alerts can avert loss or injury. Overall, it produces an intelligent, safer living space with reduced reliance on human monitoring.

Keywords— Smart surveillance, crime detection, computer vision, Gemini AI, Open CV, Fast API, MongoDB GridFS, Twilio SMS alerts, video analysis, real-time monitoring, secure login, video upload, AI- based security system.

Paper Id: A270

Non Invasive osteoporosis screening belt

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Abstract

Osteoporosis is a progressive bone disorder characterized by reduced bone mineral density (BMD) and an increased risk of fractures, often remaining undetected until severe complications arise. Conventional diagnostic methods such as Dual-Energy X-ray Absorptiometry (DEXA) are widely used but are limited by high cost, lack of portability, and exposure to ionizing radiation, making them unsuitable for frequent and large-scale screening. It presents a portable, non-invasive osteoporosis screening system based on a wearable belt type Quantitative Ultrasound (QUS) device. The proposed system operates using the Time of Flight (TOF) principle to measure the Speed of Sound (SOS) through peripheral bone regions.

Keywords: Osteoporosis, Quantitative Ultrasound (QUS), Time of Flight (TOF), Speed of Sound (SOS), Bone Mineral Density (BMD), Wearable Device, Non-Invasive Screening, ESP32, Biomedical Instrumentation.

Paper ID: A271

A Scalable Edge-Based Machine Learning Model for Intelligent Vehicular Networks

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Abstract

Vehicular Ad-Hoc Networks (VANETs) are a foundational element of modern Intelligent Transportation Systems (ITS), enabling safety-critical and delay-sensitive applications. However, existing VANET frameworks face persistent challenges associated with highly dynamic topologies, heterogeneous data streams, and latency constraints that limit real-time decision-making. This paper proposes a hybrid Machine Learning (ML)-enabled VANET architecture integrated with Edge Computing to address these limitations. A Real-Time Vehicle Data Integration (RTVDI) model is introduced to fuse GPS, V2X, and traffic signal data for accurate traffic prediction, congestion detection, and adaptive routing. The framework employs a multi-tier ML pipeline that combines deep neural networks with classical algorithms optimized for edge deployment. Real-time data processing is facilitated through Kafka-Spark streaming, while performance is assessed using SUMO, Veins, and NS-3 simulations supported by real-world datasets. Experimental evaluation is expected to demonstrate enhanced routing stability, improved communication efficiency, and reduced end-to-end latency while balancing competing QoS metrics such as accuracy, throughput, and adaptability. The proposed framework aims to provide a scalable, self-adaptive, and computationally efficient solution for next-generation ITS and large-scale vehicular networks.

Keywords- *Intelligent Transportation Systems (ITS), Edge Computing, Machine Learning, Real-Time Traffic Prediction, V2X Communication, Routing Protocols, Traffic Congestion Detection, Deep Learning, Hybrid ML Framework, RTVDI Model, Low-Latency Networks, SUMO Simulation, Vehicular Networks.*

Paper Id: A272

Lightweight Backbones for On-Board Satellite Processing: Efficient Neural Architectures for Edge AI in Remote Sensing

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Abstract

The deployment of deep learning models directly on-board Earth-observation satellites presents extraordinary opportunities for near-real-time autonomous scene understanding, change detection, and disaster monitoring. The severe constraints of space-grade hardware—restricted computational budgets, limited memory bandwidth, radiation-hardened processors, and stringent power envelopes—demand radically efficient neural network architectures. This paper conducts a systematic survey and comparative evaluation of state-of-the-art lightweight backbone networks, namely MobileNetV2, EfficientNet-B0, ShuffleNetV2, SqueezeNet, and NASNet-Mobile, adapted for on-board satellite inference. We further propose LW-SatNet, a novel hybrid depthwise separable convolutional backbone enhanced with channel attention and quantization-aware training. Experiments on five remote-sensing benchmark datasets demonstrate that LW-SatNet achieves 78.6% Top-1 accuracy with only 1.8M parameters and 22 ms latency, representing a 12.4% accuracy improvement over SqueezeNet while consuming 58% less power than EfficientNet-B0.

Keywords: Lightweight neural networks, on-board processing, satellite edge AI, depthwise separable convolutions, MobileNet, EfficientNet, remote sensing, FPGA inference, quantization-aware training, scene classification, SAR processing.

Paper Id: A273

DEVELOPMENT OF AN AUTOMATED FOGGING SYSTEM AND OPTIMIZED PLANT LAYOUT FOR CUCUMBER PRODUCTION IN A CONTROLLED ENVIRONMENT

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Abstract:

This project presents a fog-based automation system integrated with an optimized plant layout for indoor cucumber cultivation under controlled greenhouse conditions. The system is designed to regulate temperature and humidity automatically to ensure a stable environment for consistent crop growth. Sensors continuously monitor environmental parameters, and a central controller activates fog generation when temperature rises or humidity falls beyond set limits. Each fogger unit is designed to effectively cover an approximate area of 6 m², ensuring uniform microclimate distribution across the cultivation zone, with a spacing arrangement that supports 8 cucumber plants per fogging unit. The fine mist produced reduces ambient temperature through evaporative cooling while increasing moisture levels, thereby maintaining ideal growing conditions. In addition to climate control, the fogging system enables efficient delivery of plant growth boosters, fertilizers, insecticides, and fungicides through ultra-fine droplets, improving absorption and reducing chemical losses compared to conventional spraying methods. The polyhouse layout is carefully designed to ensure uniform mist distribution and proper airflow, while a drip irrigation system supplies targeted water delivery of approximately 2 liters per plant per day directly to the root zone, minimizing water wastage and enhancing nutrient uptake. The integrated system operates with minimal manual intervention, enhancing resource use efficiency and reducing labour requirements. The proposed approach improves plant growth, ensures uniform input distribution, and supports sustainable greenhouse cultivation practices with reduced environmental impact.

Keywords: Automated Fogging System, Controlled Environment Agriculture, Cucumber Cultivation, Precision Irrigation and Nutrient Delivery.

Paper Id: A274

DEVELOPMENT OF AN ACADEMIC HUB FOR EFFICIENT STUDENT MANAGEMENT

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Abstract

This paper presents an Academic Hub, a consolidated digital ecosystem developed to streamline core administrative tasks. In academic environments, faculty members often grapple with fragmented data management systems, relying on manual notebooks or disconnected spreadsheets to track student progress. By using the Flutter framework for a responsive user experience and integrating with Firebase for robust backend management, the system centralizes three critical pillars of student oversight: attendance tracking, project milestone monitoring, and internal assessment management. A key technical innovation of this hub is its offline-first capability, allowing faculty to input and access data without an active internet connection, which then synchronizes once connectivity is restored. By consolidating these disparate data points into a single, intuitive interface, the system significantly reduces the margin for manual entry errors and minimizes the administrative burden on educators. The implementation of the Academic Hub demonstrates a shift from traditional paperwork to automated workflows, ultimately allowing faculty to redirect their time toward pedagogical quality and student mentorship.

Keywords: Student Management System, Flutter, Firebase, Offline Synchronization, Educational Automation.

Paper Id: A275

Comparative Evaluation of Lactoscope and Manual Testing Methods for Quality Assessment of Ghee and Curd

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Abstract

Quality evaluation of dairy products is essential to ensure food safety, consumer protection, and compliance with regulatory standards, particularly in a rapidly expanding dairy sector such as India. Conventional manual testing methods are widely used for determining physicochemical properties of dairy products such as ghee and curd; however, automated instruments like the Lactoscope are increasingly being adopted for rapid and accurate analysis. The present study aimed to compare the efficiency and reliability of Lactoscope and traditional manual testing methods for the quality assessment of ghee and curd samples. A total of 100 samples each of ghee and curd were analysed using both conventional laboratory techniques and automated instrumental analysis. Chemicals used included sodium hydroxide (NaOH), phenolphthalein, sulphuric acid, and amyl alcohol, while equipment for manual testing comprised a hot air oven, Gerber centrifuge, burette, pipette, and butyrometer. Manual analysis involved standard titration and drying methods to determine acidity, moisture content, and solids-not-fat (SNF) content, which, although widely accepted, are time-consuming and require skilled handling. In contrast, the Lactoscope method enabled rapid and automated evaluation of the same parameters with minimal sample preparation, reduced analysis time, and improved precision. The results indicated that ghee samples had an average acidity of 2% and moisture content of 0.5%, while curd samples showed an average acidity of 2.5% and SNF content of 9.5%. Comparative evaluation revealed that the Lactoscope provided more accurate, consistent, and efficient results than manual methods, highlighting its potential for improving routine quality control in dairy industries.

Keywords: Lactoscope, Curd, Ghee, Manual Method, SNF, Acidity, Moisture

Paper Id: A276

π -Spacer Engineering: Driving Near-infrared Aggregation Induced-emission and Mechanofluorochromism in Carbazole-biscyanostilbenes

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Abstract

The rational design of organic luminophores with tunable solid-state emission and stimuli-responsive behavior is essential for advancing next-generation optoelectronic materials. In this study, we report the design and synthesis of two novel carbazole-based bis-cyanostilbene derivatives featuring distinct π -spacer units such as phenyl and thiophene, to elucidate their influence on photophysical properties. The thiophene-based system exhibits pronounced far-red/near-infrared (NIR) solid-state emission centered at 732 nm, which further red-shifts to 750 nm upon mechanical grinding, demonstrating significant mechanochromic fluorescence in the NIR region. Although its quantum yield is moderate, its stimuli-responsive emission behavior highlights its potential for advanced NIR applications. In contrast, the phenyl-based analogue shows bright solid-state emission at 596 nm with significantly enhanced quantum yield, attributed to effective suppression of π - π interactions. Both compounds display strong aggregation-induced emission (AIE) characteristics, emitting at 730 nm and 580 nm for thiophene- and phenyl-based systems, respectively. Additionally, these materials exhibit excellent thermal stability and reversible mechanochromic fluorescence (MFC). These findings underscore the crucial role of π -spacer engineering in modulating emission wavelength, efficiency, and stimuli responsiveness. Overall, this work provides valuable insights into the development of robust NIR-emissive materials with promising applications in optoelectronics, bioimaging, and smart sensing.

Keywords: Carbazole cyanostilbenes, π -spacers variants, Near Infrared Aggregation-Induced Emission, Mechanofluorochromism.

Paper Id: A277

SMART MULTI-RESTAURANT FOOD ORDERING AND DELIVERY SYSTEM

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Abstract

The Smart Multi-Restaurant Food Ordering and Delivery System is an advanced food delivery platform built to overcome the limitations of traditional single-restaurant ordering applications. The system allows users to order from multiple restaurants in a single transaction, eliminating multiple payments, separate order tracking, and redundant delivery charges. The system is developed using React.js as the frontend framework deployed on Vercel, Python Flask as the backend REST API, and PostgreSQL as the relational database. Payment processing is handled through Razorpay, and location services including restaurant discovery, delivery tracking, and route optimization are powered by the Mapbox API. The platform integrates Artificial Intelligence and Machine Learning technologies for food pairing recommendations using Collaborative Filtering, and a Convolutional Neural Network (CNN) based hygiene monitoring system achieving approximately 91% classification accuracy. A multi-stop route optimization module ensures efficient delivery path planning for orders spanning multiple restaurants. The system adopts a three-tier architecture comprising a React.js Presentation Layer, a Python Flask Application Layer, and a PostgreSQL Data Layer. Key features include a Smart Multi-Restaurant Cart with single-checkout, AI-powered recommendations, real-time Mapbox order tracking, and JWT-based role-based access control. The platform supports 10,000 or more concurrent users with a 99.5% uptime target.

Keywords: Multi-Restaurant Ordering, Smart Food Delivery, React.js, Flask API, PostgreSQL, Machine Learning, Route optimization, Real-Time Tracking.

Paper Id: A278

College Events Management

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Abstract

The College Event Management System is a web-based application designed to streamline and automate the process of managing college events efficiently. The system enables participants to register for various events online, eliminating manual paperwork and reducing administrative effort. User-friendly interfaces allow students to browse available events, submit their details, and confirm participation seamlessly.

The system securely stores participant information in a centralized database, ensuring easy access and management for event organizers. After the successful completion of events, the application automatically generates digital certificates for participants based on their registered details, improving accuracy and saving time.

Developed using modern web technologies, the system enhances transparency, reduces errors, and improves overall event coordination. This solution not only simplifies the registration and certificate generation process but also provides a scalable and efficient platform for managing multiple events within an educational institution.

Keywords: College Event Management System, Web-Based Application, Online Registration, Participant Management, Certificate Generation, Automation, Database Management, Event Coordination, Digital Platform, User Interface, Backend System, Data Security, Academic Events, Workflow Automation, Web Technologies.

Paper Id: A279

Design and Development Multi-Output DC–DC Converter for EV Auxiliary Power Application

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Abstract

Electric Vehicles (EVs) employ high voltage battery packs, while auxiliary systems like lighting, infotainment, sensors, and control units demand low voltage DC supplies. The traditional auxiliary power system employs several independent converters, thus increasing system complexity, cost, and losses. This paper describes the design and development of a multi-output DC-DC converter that converts a 48V DC input to regulated 24V, 12V, and 5V outputs using a buck converter circuit. A closed-loop control system implemented using a microcontroller provides stable voltage regulation for varying loads. Voltage and current sensing facilitate real-time monitoring and protection against overvoltage and overcurrent conditions. An IoT-based monitoring system employing ESP8266 and Arduino IoT Cloud enables remote monitoring and performance analysis. Experimental results validate stable voltage regulation, improved efficiency, reduced hardware complexity, and reliability for EV auxiliary systems.

Keywords— Electric Vehicle, Multi-Output Converter, Buck Converter, Auxiliary Power System, IoT Monitoring, Closed-Loop Control.

Paper Id: A280

Smart Lung Cancer Classifier and Life Care Assistant

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Abstract

Lung cancer kills a lot of people around the world, its one of the top causes of death from cancer. So getting it diagnosed early and right is super important for doctors. I mean, without that, things can go wrong fast. Deep learning has come a long way lately, especially for looking at medical images. It helps spot cancer automatically, like classifying different types from scans or slides. This project is about building an AI system for lung cancer, using something called transfer learning with VGG16, which is a convolutional neural network. The idea is to take histopathological images of lungs and sort them into three groups, adenocarcinoma, squamous cell carcinoma, and just normal tissue. VGG16 was trained on a huge dataset like ImageNet first, so it brings those learned features over, which is good because medical images are not always easy to get a ton of. Even with not so much data, the model does better that way. I think thats the smart part, reusing what it already knows. Then theres this Streamlit web app that makes it user friendly. You can upload an image and get predictions right away, plus how confident the AI is about it. It feels like that could make things easier. For pathologists, this system might cut down on the manual stuff they have to do, speed up decisions, and make everything more consistent. Though im not totally sure how much it changes day to day work, it seems promising. Some might say its just a tool, not a replacement, but yeah.

Keywords: Lung Cancer, Convolutional Neural Networks, VGG16, Clinical Decision Support System, Medical Image Classification, Deep Learning, Healthcare AI.

Paper Id: A281

Activation Energy-Driven MHD Nanofluid Transport over a Nonlinear Stretching Darcy-Forchheimer Surface: An Entropy and Bejan number Analysis

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Abstract

This study investigates the steady two-dimensional magnetohydrodynamic (MHD) boundary-layer flow of an incompressible nanofluid over a nonlinearly stretching surface embedded in a Darcy-Forchheimer porous medium. The model accounts for the combined effects of velocity, thermal and concentration slip conditions, internal heat generation, and Arrhenius-type activation energy in the presence of a transverse magnetic field. By employing suitable similarity transformations, the governing nonlinear partial differential equations are reduced to a system of coupled ordinary differential equations, which are solved numerically using MATLAB's *bvp4c* solver. The thermodynamic behavior of the system is analyzed through entropy generation and the Bejan number, which quantify total irreversibility and the relative contribution of heat transfer irreversibility, respectively. The influence of key physical parameters, particularly the Eckert number and thermal slip parameter, is examined in detail. The results indicate that an increase in the Eckert number significantly enhances entropy generation due to intensified viscous dissipation, while simultaneously reducing the Bejan number, indicating a shift toward fluid friction irreversibility. In contrast, thermal slip weakens temperature gradients near the surface, thereby reducing entropy generation and improving thermal efficiency. Furthermore, statistical analysis using analysis of variance (ANOVA) confirms that viscous dissipation is the dominant factor influencing entropy generation. A strong inverse relationship between entropy generation and the Bejan number is also observed. These findings provide important insights for the design and optimization of energy-efficient nanofluid systems with reduced thermodynamic losses.

Keywords: Darcy-Forchheimer porous medium, Viscous dissipation, Activation Energy , Thermal slip, Entropy generation, Bejan number, ANOVA sensitivity analysis

Paper ID: A282

Exploring the Rental Appliance Economy in Bangalore A Study on Consumer Behaviour, Market Structure, and Industry Opportunities

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Abstract

The emergence of the sharing economy has transformed traditional consumption patterns by shifting consumer preference from ownership-based consumption to access-based consumption. Instead of purchasing products for long-term ownership, consumers increasingly prefer temporary access through rental platforms. Rental appliances have become particularly relevant in urban environments where mobility, temporary living arrangements, and financial considerations influence consumption behaviour. In cities such as Bangalore, a large population of students and working professionals frequently relocate, creating demand for flexible and cost-effective alternatives to purchasing household appliances. Despite the rapid growth of rental platforms, limited research has explored consumer perceptions and behaviour toward rental appliance services, particularly in the Indian context. This study aims to examine consumer behaviour, satisfaction, and key factors influencing the adoption of rental appliance services in Bangalore. A qualitative research approach was adopted, and primary data were collected through structured interviews with students and working professionals who were aware of or had experience using rental services. The collected interview transcripts were analysed using thematic analysis supported by NVivo qualitative data analysis software to identify recurring themes and patterns in consumer responses. The findings reveal that affordability, flexibility, and temporary living arrangements are the primary motivations driving the adoption of rental appliance services. Consumers prefer renting appliances to avoid large upfront purchase costs and the inconvenience of transporting appliances during relocation. In addition, factors such as product quality, platform reputation, customer reviews, and delivery services influence the selection of rental platforms. Most respondents reported positive experiences with delivery, installation, and customer support, although challenges such as high security deposits, delayed deliveries, and occasional product quality issues were identified. The study highlights the growing significance of rental appliance services within urban markets and suggests potential opportunities for appliance manufacturers and rental platforms to develop rental-oriented business models that address the evolving needs of mobile urban consumers.

Keywords: Rental economy, sharing economy, consumer behaviour, appliance rental, access-based consumption.

Paper ID: A283

Future Scope of Artificial Intelligence in Medical Science

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Abstract:

Artificial Intelligence (AI) is poised to revolutionize medical science and healthcare through significant advancements in diagnostic accuracy, personalized treatment, and drug discovery. This comprehensive review explores the current status, future prospects, and key challenges associated with the integration of AI in medical science. The analysis highlights that, while AI has immense potential to improve healthcare delivery through enhanced diagnostics, precision medicine, and operational efficiency, several critical challenges must be addressed. These include ethical concerns, data privacy and confidentiality issues, algorithmic bias, and regulatory constraints. Addressing these challenges is essential for the sustainable and responsible implementation of AI in healthcare systems. Emerging trends such as explainable AI, multimodal data integration, and biotechnology convergence are expected to further strengthen AI's transformative impact. These developments promise to make healthcare systems more accessible, accurate, efficient, and patient-centered in the near future.

Keywords: Artificial Intelligence (AI), Healthcare Innovation, Precision Medicine, Data Privacy, Explainable AI.

Paper Id: A284

Social Value Creation by Sustainable Investments: A Systematic Literature Review Using the PRISMA Framework

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Abstract:

This study presents a systematic literature review (SLR) of research on social value creation through sustainable investments, aiming to map the intellectual structure of the field, identify dominant themes, and propose future research directions. A tri-method approach integrating SLR, bibliometric analysis, and content analysis was employed. Following PRISMA 2020 guidelines, 274 articles were initially retrieved from Scopus, resulting in a final sample of 110 peer-reviewed studies published between 2003 and 2026. The selected articles were analysed using the TCM-ADO framework to structure data extraction and synthesize insights. Bibliometric analysis using VOSviewer identified eight key research streams, including social impact measurement, health and wellbeing, environmental sustainability, socio-economic evaluation, healthcare outcomes, public health, social enterprise, and expert consensus methods. The findings indicate strong emphasis on social impact evaluation, particularly through Social Return on Investment (SROI), alongside growing interest in sustainable finance and societal wellbeing. Key antecedents include regulatory pressure, stakeholder expectations, and investor demand, while outcomes focus on social value generation and improved wellbeing. The study contributes by providing a structured conceptual map and identifying theoretical and contextual gaps, offering insights for researchers, practitioners, and policymakers to advance sustainable investment practices.

Keywords: Sustainable Investment; Social Value Creation; Social Impact; Impact Investing; Systematic Literature Review; PRISMA Framework; Bibliometric Analysis; TCM-ADO Framework; Sustainable Finance; Social Return on Investment (SROI)

Paper Id: A285

FIRE FIGHTING ROBOT USING WIRELESS SENSOR.NETWORK AND RF TECHNOLOGY

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Abstract

Fire accidents in industrial, commercial, and residential environments can cause serious damage to human life and property. Early detection and rapid response are essential to reduce the impact of such disasters. This paper presents the design and implementation of a fire fighting robot using a Wireless Sensor Network (WSN) and RF communication technology. The system is divided into three zones equipped with different sensors such as smoke sensor, temperature sensor, and flame sensor to detect fire-related hazards. When any sensor detects abnormal conditions, the information is transmitted wirelessly using RF technology to the robot unit. The robot autonomously moves toward the affected zone and activates a water spraying mechanism to extinguish the fire. At the same time, system status and sensor data are displayed on an IoT monitoring webpage for remote supervision. The proposed system improves response time, reduces human risk, and enhances fire safety management.

Keywords: Fire Fighting Robot, Wireless Sensor Network, RF Communication, Flame Sensor, IoT Monitoring, Embedded System.

Paper Id: A286

Environmental Science and the Need for Sustainable Development

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Abstract

Environmental science is an interdisciplinary field that examines the relationship between humans and the natural environment. It studies major environmental issues such as pollution, climate change, deforestation, biodiversity loss, and the depletion of natural resources. The primary aim of environmental science is to raise awareness about environmental protection and encourage the sustainable use of resources. This field emphasizes understanding the causes and consequences of environmental degradation. It also highlights the role of human activities in disturbing ecological balance. Environmental science promotes conservation practices and responsible resource management. It stresses the importance of environmental education in creating informed and responsible citizens. The implementation of effective environmental policies is essential to address global environmental challenges. Encouraging sustainable lifestyles and eco-friendly practices can help reduce environmental damage. Overall, environmental science plays a crucial role in ensuring a healthy and sustainable future for present and future generations.

Keywords: Environmental science, Environmental awareness, Natural resources, Pollution, Climate change, Biodiversity conservation

Paper Id: A287

PHYTOGUARD: AN EIGEN-AWARE ATTENTION – BASED HYBRID CNN-TRANSFORMER MODEL FOR LEAF DISEASE CLASSIFICATION

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Abstract

Early diagnosis of plant leaf diseases is essential for improving crop yield and minimizing agricultural losses. This paper presents a deep learning (DL)-based framework for the automatic classification of plant leaf diseases using leaf image datasets such as the Plant Village dataset. The proposed approach focuses on the classification stage, employing advanced architectures to categorize leaf images of crops like potato and rice into multiple disease classes, including Potato Early Blight and Brown Spot. Four models are evaluated: EfficientNet-B3, Swin Transformer, Proposed Eigen Swin Transformer (E-Swin), and a Proposed Hybrid Model, enabling a comprehensive comparison of convolutional, transformer-based, and hybrid approaches. Efficient Net-B3 is employed as a core feature extractor due to its efficient architecture and strong capability in capturing Low-Level Spatial Features. The Swin Transformer captures Global Contextual Relationships through a hierarchical design with shifted-window self-attention, while the E-Swin Transformer further enhances feature representation using Eigen-based Shifted-Window Attention mechanisms. To improve E-Swin Transformer's performance, a hybrid model integrating EfficientNet-B3 and E-Swin is proposed, leveraging the strengths of both Convolutional and Transformer-based Learning. In the proposed hybrid model, EfficientNet-B3, enhanced with Convolutional Block Attention Module (CBAM) and Atrous Spatial Pyramid Pooling (ASPP), extracts low-level spatial features, while E-Swin captures high-level contextual representations. The fusion of these complementary features enables more robust and accurate classification. Experimental results demonstrate that the proposed model achieves 96% classification accuracy, highlighting its effectiveness and potential for real-time automated plant leaf disease detection systems.

Keywords: Plant Leaf Disease Detection, Deep Learning, EfficientNet-B3, Swin Transformer, Eigen Swin Transformer, Hybrid Model, Image Classification.

Paper Id: A288

Effect of Influencer Marketing on Brand Trust and Consumer Engagement in the Skincare Industry

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Abstract

The rapid growth of social media has significantly transformed marketing strategies, particularly in the skincare industry, where influencer marketing has emerged as a powerful tool for shaping consumer perceptions and building brand trust. Despite its growing importance, limited research exists on how specific influencer-related factors impact engagement and trust within the Indian skincare market. This study examines the effect of influencer marketing factors on brand trust and influencer engagement using a quantitative research approach. Primary data was collected through a structured questionnaire distributed among social media users who follow influencers and use skincare products, resulting in 116 valid responses obtained through convenience sampling. The study considers credibility, trust, emotional connection, and overall brand view as independent variables, while influencer engagement is treated as the dependent variable. Multiple linear regression analysis was employed to examine the relationships among these variables. The findings reveal that credibility and emotional connection have a significant positive impact on influencer engagement, whereas trust and overall brand view were found to be statistically insignificant. The model explains a moderate level of variation in influencer engagement, indicating that influencer-related factors moderately influence consumer behavior. The study suggests that skincare brands can achieve better results by collaborating with credible influencers who connect well with their audience. When influencers appear genuine and relatable, they can enhance engagement and strengthen brand trust. This research contributes to the existing literature by focusing on the Indian skincare industry and highlights the importance of influencer credibility and emotional connection in developing effective influencer marketing strategies.

Keywords: Influencer Marketing, Brand Trust, Credibility, Emotional Connection, Skincare Industry, Consumer Engagement

Paper Id: A289

Smart Battery Abnormalities Prediction in E Vehicles Using Multi Sensor Fusion and IoT

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Abstract

The usage of Electric Vehicles (EVs) increases every day. EVs run on Lithium-ion batteries. Due to improper battery monitoring system, thermal runaway is possible due to high voltages and currents exceeding certain thresholds. An efficient battery monitoring system is needed to enhance the quality of battery life, to prevent fire accidents, and to avoid economic losses. We have developed a model to prevent the economic loss by monitoring the excessive heat of the battery by temperature sensor. Similarly, if the voltage and current threshold levels exceed, such sort of abnormalities will be monitored by voltage and current sensors respectively. Battery Performance is also monitored by two additional sensors flame sensor, and Vibration sensor. The data acquired from the sensors are analyzed by the Arduino UNO microcontroller and if any potential risk behavior is noticed, then the dc motor and the cooling fan will be activated with audio and visual alarm locally. Remote alert is added with the working model using GSM/Wi-Fi Module.

Keywords: Battery Monitoring System, Electric Vehicles, IoT, Sensors.

Paper Id: A290

SATELLITE BASED FLOOD MAPPING AND ANALYSIS USING DEEP LEARNING

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ABSTRACT :

Floods are among the most destructive natural disasters, causing significant damage to human life, infrastructure, and ecosystems. Identifying flood-prone areas and understanding environmental conditions that lead to flooding are essential for improving disaster preparedness and reducing potential losses. This study focuses on analysing environmental indicators to assess the likelihood of flood occurrence in vulnerable regions. Important parameters such as rainfall intensity, atmospheric temperature, humidity levels, and soil moisture conditions are considered to understand how variations in these factors influence flooding patterns.

Environmental and meteorological information obtained from satellite observations and weather monitoring datasets is used as the primary input for the analysis. A rule-based analytical algorithm evaluates the relationship between rainfall accumulation, soil saturation levels, and atmospheric conditions to determine possible flood risk. By examining these environmental indicators together, the system estimates the probability of flood occurrence in a given area. The analysis primarily concentrates on pre-flood assessment, where environmental data is studied to detect conditions that may lead to flooding. In addition, the approach also supports post-flood mapping, which helps in identifying affected regions and understanding the spatial extent of flood impact after an event occurs.

Existing studies use deep learning and remote sensing for flood detection, but many models have high complexity and limited real-time efficiency. The outcome of this study is a structured flood risk evaluation that highlights areas with higher vulnerability to flooding. By continuously examining environmental patterns and flood-related indicators, the system provides useful insights that can support early awareness and better preparedness. This approach demonstrates how environmental data analysis and algorithm-based evaluation can contribute to improved monitoring of flood risks and assist decision-making processes for disaster management and community safety.

KEYWORDS : Flood Prediction, Flood Risk Assessment, Environmental Monitoring, Rainfall Analysis, Soil Moisture Analysis, Meteorological Data, Pre-Flood Assessment, Post-Flood Mapping, Disaster Preparedness, Flood Impact Analysis

Paper ID: A291

Experimental Study on The Mechanical Properties of Natural Hybrid Composite

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Abstract

This study focuses on the development of sustainable natural hybrid composites using bamboo mesh, biochar-modified epoxy resin, and rock wool fiber. The increasing demand for eco-friendly and biodegradable materials has driven the need for alternatives to conventional synthetic composites. In this work, bamboo mesh is utilized for its high strength and structural stability, biochar-enhanced epoxy resin improves interfacial bonding and environmental compatibility, and rock wool fiber contributes to thermal insulation and fire resistance. The composite specimens are fabricated through a layered molding technique with varying proportions of epoxy, biochar, and reinforcing fibers. Mechanical properties of the developed composites are evaluated through tensile, flexural, and impact testing. Additionally, flammability tests are conducted to assess fire-resistant characteristics. The results indicate that the hybrid composites exhibit improved mechanical performance along with enhanced thermal and fire-resistant properties. These materials are lightweight, cost-effective, and environmentally sustainable. The study demonstrates the potential of natural hybrid composites as viable alternatives for engineering applications, thereby reducing dependence on synthetic materials and promoting eco-conscious manufacturing practices.

Keywords: Natural fiber composites, Biochar, Epoxy resin, Mechanical properties, Flammability test, Sustainable materials

Paper Id: A292

NANO-CELLULOSE BASED HEMOSTATIC PATCH FROM BANANA PEEL

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Abstract

This project focuses on the extraction of nanocellulose from banana peel for hemostatic applications. Banana peel, an agricultural waste, is used as a low-cost and eco-friendly raw material. The peels are washed, dried, and treated with sodium hydroxide (NaOH) to remove lignin and impurities. The purified cellulose is then subjected to acid hydrolysis using sulfuric acid (H₂SO₄) to obtain nanocellulose. The prepared nanocellulose has high surface area and good biocompatibility, which makes it suitable for biomedical use, especially in controlling bleeding. Characterization techniques such as FTIR, UV spectroscopy, and SEM analysis are used to confirm the structure and properties of the nanocellulose. This study aims to develop an effective, biodegradable, and affordable hemostatic material. Additionally, it promotes sustainable waste management by converting banana peel into a valuable biomedical product.

Keywords: Nanocellulose, Banana Peel, Hemostatic Patch, Biocompatibility, Acid Hydrolysis, Biomedical Application, FTIR, UV, SEM Analysis

Paper Id: A293

A Study on the Influence of Quick Commerce on the buying Behaviour of Generation – Z

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Abstract

Quick commerce has emerged as a disruptive force in the digital retail landscape, offering ultra-fast delivery (often within 10–30 minutes), convenience, and attractive discounts, particularly reshaping consumer habits in urban India. This study examines the influence of quick commerce on the buying behaviour of Generation Z, focusing on key factors such as convenience, speed of delivery, discounts, and brand trust. The research adopts a quantitative approach, utilizing a structured questionnaire to collect primary data from Generation Z consumers. The findings indicate that Generation Z is strongly influenced by quick commerce attributes convenience, rapid delivery, and discounts leading to increased impulse purchasing and a reduced reliance on pre-planned shopping. Quick commerce platforms demonstrate significant potential to shape and drive the purchasing decisions of this demographic. The study provides valuable insights for marketers and enterprises aiming to leverage quick commerce for building brand loyalty and engaging Generation Z consumers effectively. It also highlights implications for strategy formulation in the evolving digital retail ecosystem.

Keywords: Quick Commerce, Generation Z, Buying Behaviour, Convenience, Impulse Buying, Digital Retail, Fast Delivery

Paper Id: A294

AcciAlert: Real-Time Traffic Accident Detection and Notification System

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Abstract

Road accidents remain a major global concern, leading to significant loss of life and property due to delayed detection and emergency response. This paper presents AcciAlert, an automated and scalable system designed for real-time traffic accident detection using deep learning and computer vision techniques. The proposed system utilizes a pre-trained TensorFlow SSD MobileNet V1 model in conjunction with the MS COCO dataset to detect and classify vehicles in video streams.

The system processes traffic footage by analyzing vehicle motion patterns and identifying anomalies such as sudden stops, collisions, and abnormal trajectories. Key methodologies include Intersection over Union (IoU) for object tracking and temporal analysis to enhance detection accuracy. Upon identifying a potential accident, the system generates instant alerts to relevant authorities, thereby reducing response time and improving emergency management efficiency.

Experimental results demonstrate that the system achieves reliable detection performance under varying traffic conditions, making it suitable for smart city applications. AcciAlert offers a cost-effective and scalable solution that can be integrated with existing surveillance infrastructure to enhance road safety and reduce accident-related fatalities.

Keywords: SSD MobileNet V1, Real-Time Monitoring, Object Detection, IoU (Intersection over Union)

Paper ID : A295

Ransom Shield: A Multilayered Defense Framework Against Modern Ransomware Threats

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ABSTRACT:

Ransomware has emerged as one of the most financially devastating and operationally disruptive forms of cyber attack targeting critical infrastructure, healthcare systems, financial institutions, and government agencies worldwide. This paper presents a comprehensive investigation into the anatomy of modern ransomware campaigns, tracing the evolution from early opportunistic encryption-based attacks to highly sophisticated, nation-state-affiliated operations employing advanced persistent threat (APT) techniques. We systematically analyze primary intrusion vectors including spear-phishing, Remote Desktop Protocol (RDP) exploitation, zero-day vulnerabilities, and supply chain compromises - alongside the technical mechanisms of file encryption, credential harvesting, and lateral movement employed by contemporary ransomware families such as LockBit, BlackCat (ALPHV), and Cl0p. A central contribution of this research is the examination of the Ransomware-as-a-Service (RaaS) business model and its role in democratizing cybercrime, enabling low-skill threat actors to deploy enterprise-grade ransomware through affiliate networks. Empirical analysis of documented incidents from 2020-2024 reveals a substantial increase in ransom demand amounts, attack frequency, and mean time to detection, underscoring the inadequacy of traditional perimeter-based security models. In response to these threats, this paper proposes a multilayered defense framework anchored in Zero Trust Architecture (ZTA), integrating behavioral anomaly detection, endpoint detection and response (EDR), immutable offline backup strategies, network micro-segmentation, and threat intelligence sharing platforms. We evaluate the efficacy of these controls against real-world attack scenarios and discuss the critical role of organizational resilience planning, including incident response playbooks, tabletop exercises, and cross-sector information sharing. Additionally, the paper addresses regulatory and policy dimensions, reviewing the implications of frameworks such as NIST CSF, ISO/IEC 27001, and emerging legislative mandates on ransomware payment disclosure. Our findings highlight that no single control is sufficient to neutralize ransomware risk; rather, a proactive, combining technology is essential to minimize exposure and accelerate recovery. intelligence-driven security posture safeguards, human-centric training, and robust governance . This research contributes a reproducible evaluation methodology and strategic roadmap for cybersecurity practitioners and policymakers navigating the ransomware threat landscape.

Keywords: Ransomware, Ransomware-as-a-Service (RaaS), Double Extortion, Zero Trust Architecture, Endpoint Detection and Response, Threat Intelligence, Incident Response, Cybersecurity, Encryption, Supply Chain Attack.

Paper Id: A296

PHISHING WEBSITES DETECTION USING MACHINE LEARNING WITH GRADIENT BOOSTING CLASSIFIER

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Abstract:

Phishing is a type of online scam where attackers trick people into sharing personal information like usernames, passwords, or bank details by sending them to fake websites. These fake websites are carefully made to look just like real ones, using the same logos, layouts, and designs. Because of this, people often think they're using a trusted site, like their bank or a shopping website, when in reality, it's a scam. As phishing attacks become more clever and harder to detect, basic security tools like antivirus software and firewalls are no longer enough. That's why we need smarter, more flexible ways to spot these threats—this is where Machine Learning (ML) comes in. ML helps computers learn from data and spot patterns, even when scammers change their tricks. In our project, we use a machine learning method called Gradient Boosting Classifier (GBC) to detect phishing websites. GBC is a powerful technique that combines many small decision trees (simple models) to make one strong model. Each tree improves on the mistakes of the previous one, which helps increase the overall accuracy of the system. This makes it great for handling tricky and complicated data. To start, our system looks at certain parts of a website's URL, such as how long it is, whether it includes special characters or IP addresses, whether it uses HTTPS, and how many subdomains it has. These little details can help tell the difference between a real website and a fake one. After collecting this information, we train the GBC model using a dataset that contains both phishing and real URLs. The model learns what a phishing website usually looks like. Then, when we give it a new URL, it can decide whether it's safe or dangerous. This helps protect users in real time by warning them before they visit harmful websites.

Keywords: Phishing Detection, Machine Learning, Gradient Boosting Classifier, URL Feature Extraction, Website Spoofing, Cybersecurity, Supervised Learning, Web Application Security, Real-time Detection, Information Security

Paper ID : A297

Smartphone-Based Academic Stress Detection Using Machine Learning

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Abstract

This study investigates the development and validation of an academic stress detection system that uses machine learning algorithms to analyse behaviour data collected from universities via smartphones. A behavioural dataset (including over 1,500 weeks of student behavioural logs) was developed based on published research and includes 7 raw behavioural features (daily usage time, frequency of unlocks, social media use, use of study apps, entertainment use at night, and total time spent in bed at night) and 4 composite features (e.g., night usage ratio). Using logistic regression (LR) and random forest (RF) classifiers, machine learning classification techniques effectively identified whether a student experienced academic stress using only human behavioral data collected by smartphones. Results demonstrated that LR and RF models achieved a predicted accuracy level of 77% using only 30 to 40% of actual student-week behavioural data records and 80% accuracy with a full dataset. The findings from this study demonstrate that machine learning algorithms can be used as a valid assessment tool for academic stress as they relate to university student study behaviour patterns. The RF models were assessed using the stratified hold-out method, which resulted in higher performances than the baseline of using rule-based cut points. LR's 91.00% accuracy (macro F1 = 0.91) compared to RF's 88.33% accuracy (macro F1 = 0.88) are also much greater than the baseline of 62.67%. When looking at the features in the RF model, the derived composite variables account for 55.6% of the predictive power in the RF model; thus, indicating that engineering derived from domain-specific knowledge is useful. Sleep-related behavior features are the most important variables in predicting sleep patterns, consistent with what has been found in clinical settings. The system is lightweight, straightforward to interpret, and can be implemented on standard smartphones without use of any physiological sensors.

Keywords : Academic stress detection, smartphone behavioral sensing, machine learning, logistic regression, random forest, passive monitoring, digital mental health, feature engineering, sleep deficit, student well-being, behavioral digital phenotyping.

Paper Id: A298

Plant-Assisted Synthesis and Multifunctional Evaluation of Banana Flower Waste-Derived Palladium Nanoparticles (PdNPs)

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Abstract

This study describes a green, plant-assisted, and sustainable method for the synthesis of palladium nanoparticles (PdNPs) using banana flower pistil extract, which is considered a less utilized agro-waste material containing high amounts of polyphenolics and flavonoids. The extract serves as a natural reducing and stabilizing agent, while NaBH₄ is employed as a co-reducing agent to ensure efficient reduction and controlled nanoparticle formation. The synthesized PdNPs were characterized using UV-Vis spectroscopy, FTIR, SEM, and XRD techniques, confirming the formation of crystalline nanoparticles. The functional properties of PdNPs were assessed through antioxidant activity using the DPPH method, where the nanoparticles exhibited significant free radical scavenging, indicating their high ability to transfer electrons. Even though the plant extract showed high antioxidant activity, PdNPs showed high activity per unit concentration, indicating their high reactivity. Further studies focus on the catalytic activity towards the reduction of 4-Nitrophenol and the evaluation of peroxidase-like nanozyme activity for hydrogen peroxide detection, which is essential to explore their possible use in real-world applications. Overall, this work highlights the valorization of agricultural waste into multifunctional nanomaterials with promising applications in environmental remediation and biosensing.

Keywords: Palladium nanoparticles (PdNPs), Plant-assisted synthesis, Waste valorization, Antioxidant activity (DPPH), Environmental catalysis, Nanozyme activity.

Paper Id: A299

Green Synthesis and Multifunctional Applications of *Ananas comosus* Leaf-Derived Gold Nanoparticles (AuNPs)

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Abstract

The present study reports a sustainable green synthesis of gold nanoparticles (AuNPs) using *Ananas comosus* (pineapple) leaf extract as a dual-function reducing and capping agent. The successful formation of AuNPs was confirmed by a distinct colour transition and a characteristic surface plasmon resonance (SPR) band observed in UV–Vis spectroscopy. Comprehensive characterization through XRD, SEM, and FTIR analyses revealed the formation of crystalline, predominantly spherical nanoparticles stabilized by plant-derived phytochemicals. The synthesized AuNPs exhibited notable multifunctionality. pH-responsive studies demonstrated significant optical sensitivity, highlighting their applicability as efficient colorimetric pH sensors with enhanced stability in alkaline conditions. Antioxidant activity evaluated via the DPPH assay showed strong free radical scavenging potential. Additionally, the AuNPs demonstrated prominent oxidase-mimic (nanozyme) activity, enabling catalytic oxidation reactions without external oxidizing agents such as H₂O₂. Overall, this approach offers a cost-effective, eco-friendly, and scalable strategy that utilizes agricultural waste, reducing environmental impact while producing biocompatible nanomaterials with promising applications in biosensing, catalysis, environmental monitoring, and biomedical fields.

Keywords: Gold nanoparticles (AuNPs), Green synthesis, *Ananas comosus*, Surface plasmon resonance, Antioxidant activity, pH sensing, Nanozyme, Biosensing, Sustainable nanotechnology.

PAPER ID: A300

EEG–EMG Fusion Using Dual-Branch CNN Autoencoder for Anomaly Detection

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Abstract

Detecting anomalies in physiological signals is important for early diagnosis and continuous health monitoring. In this work, EEG (electroencephalography) and EMG (electromyography) signals are used to identify anomaly patterns. A dual-branch CNN autoencoder is used to learn how normal signals behave and then detect any deviations based on reconstruction error. The EEG and EMG signals are first handled separately, and later their outputs are combined using a fusion method to improve the overall detection performance and reliability. The model shows stable performance during cross-validation and is able to detect anomaly cases consistently. When it is tested on a separate held-out dataset, the model still performs well and detects all anomaly samples. It is also observed that combining two different physiological signals gives better information compared to using only a single signal. This makes the system more robust and reduces the possibility of missing abnormal patterns. Overall, the results indicate that using both EEG and EMG together can improve anomaly detection and can be useful for real-time healthcare monitoring as well as early warning systems.

Keywords: EEG, EMG, Anomaly Detection, CNN Autoencoder, Reconstruction Error, Signal Fusion, Healthcare Monitoring

Paper Id: A301

MIND : Mind Matrix using AI

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Abstract

Artificial Intelligence (AI) has emerged as a powerful tool in transforming mental health diagnostics by enabling intelligent systems to analyze user data and generate predictive insights for early detection and intervention. With the increasing prevalence of mental health disorders and the growing availability of digital data sources such as clinical surveys and social media, AI-based systems like Mind Matrix play a crucial role in providing scalable and efficient solutions. This paper presents a comprehensive study of the Mind Matrix system, which utilizes machine learning techniques, particularly the Naïve Bayes classifier, to detect and classify mental health conditions such as depression, anxiety, and stress. The study explores different variants of Naïve Bayes along with feature engineering methods including TF-IDF and natural language processing techniques for analyzing both structured and unstructured data. Furthermore, an experimental framework is proposed to evaluate the performance of various models using metrics such as accuracy, precision, recall, F1-score, and ROC-AUC. The research also highlights the system architecture, practical applications, benefits, challenges, and future directions of AI-driven mental health diagnostic systems.

Keywords: Artificial Intelligence, Mind Matrix, Mental Health, Naïve Bayes, NLP, Depression Detection.

Paper Id: A302

Thermal Analysis of Switched Reluctance Motor used in Aircraft Applications

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Abstract

The increasing demand for reliable and efficient electrical machines in aircraft applications have encouraged the adoption of Switched Reluctance Motor (SRM) due to its simple construction, high fault tolerance nature, and ability to operate in extreme conditions. Among various configurations of SRM, 12/8 SRM is widely preferred because it provides improved torque characteristics and reduced acoustic noise compared to other configurations. The present work aims to design and analyze the 12/8 SRM using finite element analysis as well as to investigate the thermal nature of the proposed model with different cooling arrangements. The thermal analysis is carried out on each pole and slot of the SRM and results are compared. The results reveal the best and suitable cooling arrangement for efficient thermal management of the SRM and make it more suited for aircraft applications. Further, the study can be extended with hardware validation for effective deployment.

Keywords: Switched Reluctance Motor (SRM); Thermal Analysis; Finite Element Analysis; Thermal Management; Cooling Techniques; Modelling; Motor Fins.

Paper Id: A303

A Strategic HR Perspective on the Efficiency of Psychometric Testing in Hiring

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ABSTRACT

Organizations strive to use efficient recruitment techniques in today's cutthroat business climate in order to choose the best applicants for open positions. A thorough grasp of a candidate's skills, personality, and behavioural attributes may not always be possible with traditional recruitment techniques like resume screening and interviews. In order to get around these restrictions, a growing number of businesses are using psychometric testing as an objective, scientific method of hiring. From the standpoint of strategic human resource management, the current study investigates the efficacy of psychometric testing in hiring. The primary goal of the study is to examine the ways in which psychometric tests enhance recruitment bias reduction, job performance, employee retention, and selection quality. Organizations can make more data-driven and objective recruiting decisions by using psychometric tests to assess individuals' cognitive talents, personality traits, emotional intelligence, and behavioural inclinations. Both primary and secondary data sources served as the study's foundation. A standardized questionnaire was used to gather primary data from HR specialists, recruiters, managers, and workers with exposure to or experience with hiring procedures. In order to investigate the connection between psychometric testing and recruiting outcomes, the study uses a descriptive research methodology and statistical techniques to analyse the data gathered. The study's conclusions imply that psychometric testing is important for increasing the efficacy of hiring. It promotes better person-job fit, increases employee retention, improves candidate selection accuracy, and aids in predicting work success. Standardized testing practices also lessen the impact of subjective judgment and personal bias in hiring selections.

Keywords: Psychometric Testing, Recruitment, Strategic Human Resource Management, Selection Quality, Employee Retention, Recruitment Bias.

Paper ID: A304

Smart Mine Safety Network Using Wireless Communication and Real-Time Location Tracking

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Abstract

Underground mining is a hazardous profession with constant risks of accidents due to unsafe environmental conditions and worker health issues such as exposure to harmful gases, extreme temperatures, and physical strain. Workers often face difficulties in receiving timely assistance due to the challenging underground environment with limited communication infrastructure. The lack of real-time monitoring leads to delayed emergency responses, exacerbating the risk to worker safety. This project proposes a Mine Worker Monitoring System that uses an ESP32-based wearable device to monitor essential health and environmental parameters of miners in real-time. The system integrates sensors for temperature, heart rate, breathing rate, and gas detection (MQ series) to monitor workers' physical conditions, while also employing GPS for location tracking. Data from these sensors is transmitted through LoRa modules to a surface control station, which then uploads it to an IoT platform for live monitoring. The system aims to detect unsafe conditions such as high gas concentrations or abnormal body parameters, triggering alarms and alerting supervisors to take necessary actions, thereby enhancing the safety and well-being of miners.

Keywords: Underground Mine Communication, Internet-Independent Wireless Network, Miner Safety System, ESP32, IOT Platform, Real-Time Location Tracking, Self-Healing Wireless Network, Wireless Sensor Network, Disaster Management System.

Paper Id: A305

Recommendation Engine Development with Voice Interface & Gamification: An Intelligent and Engaging Approach

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Abstract

Recommendation systems have become integral to modern digital platforms, driving user engagement across e-commerce, entertainment, and education domains. This paper presents an advanced recommendation engine that extends beyond traditional approaches by integrating voice/chatbot interaction and gamification features to create a more engaging and interactive user experience. The proposed system employs a hybrid methodology combining collaborative filtering, content-based filtering, and ensemble techniques to deliver personalized recommendations. Natural Language Processing (NLP) enables users to interact conversationally with the system (e.g., "Recommend me something like Inception but simpler"), while gamification elements including daily discovery challenges, reward points, and leaderboards enhance user retention and satisfaction. Experimental results demonstrate significant improvements in user engagement metrics and recommendation accuracy compared to conventional systems. The framework achieves a precision of 89%, recall of 87%, and an F1-Score of 88%, while reducing cold-start issues through intelligent fallback mechanisms. This work contributes to the evolution of recommendation technologies by providing a user-centric, intelligent, and engaging solution adaptable to multiple domains.

Keywords: Recommendation Systems, Collaborative Filtering, Content-Based Filtering, Natural Language Processing (NLP), Voice Interface, Gamification, Hybrid Recommendation.

Paper Id: A306

Metabolic Syndrome and Atherosclerosis: Pathophysiological Links and the Role of the Triglyceride- Glucose (TyG) Index

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Abstract

Metabolic syndrome is a multifactorial disease that is found to be associated with Central obesity, insulin resistance, dyslipidemia, hypertension, and impaired glucose metabolism. This syndrome dramatically raises the risk of type 2 diabetes and cardiovascular illnesses. One of the most significant side effects of metabolic syndrome is atherosclerosis, a chronic inflammatory disease of the artery wall. The metabolic abnormalities of metabolic syndrome promote oxidative stress, endothelial dysfunction, and persistent low-grade inflammation, all of which contribute to the accumulation of lipids and plaque in arterial walls. These mechanisms speed up the development of atherosclerosis and raise the risk of peripheral vascular disease, coronary artery disease, and stroke. The Triglyceride-Glucose (TyG) index, which is based on fasting glucose and triglyceride levels, has become a straightforward and reliable surrogate indicator of insulin resistance and a predictor of cardiometabolic risk in recent years. The development of atherosclerotic cardiovascular disease, endothelial dysfunction, and metabolic syndrome has all been closely linked to elevated TyG index levels. Therefore, the current study aims to highlight the importance of TyG as a useful and cost-effective tool for early identification for the early detection of people at high risk for metabolic syndrome and associated atherosclerotic consequences.

Keywords: Metabolic syndrome; Atherosclerosis; Triglyceride-glucose index; Insulin resistance; Dyslipidemia; Cardiovascular disease; Endothelial dysfunction; Inflammation.

Paper Id: A307

Shock Wave–Assisted Advanced Processing of Concrete Materials Using an Optimized Conical Nozzle for High-Performance Construction Applications

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Abstract

Hollow blocks are extensively used in modern construction due to their lightweight structure, thermal insulation properties, and cost efficiency. However, conventional fabrication methods such as manual compaction and vibration often lead to non-uniform density, improper bonding of materials, and reduced mechanical strength. To overcome these limitations, this project proposes an innovative technique based on the expansion of shock waves using a designed conical nozzle for improved hollow block fabrication. Shock waves generated inside a shock tube produce high-pressure impulses capable of enhancing particle rearrangement and compaction within the mixture of M-sand and cement. The conical nozzle plays a critical role by expanding and directing the shock waves uniformly over the material surface, ensuring controlled energy distribution and minimizing localized stress concentration. This process improves particle packing, reduces void formation, and strengthens inter-particle bonding, resulting in enhanced compressive strength and durability of hollow blocks.

The study focuses on the design and optimization of the conical nozzle to achieve efficient shock wave expansion and uniform pressure application. Compared to conventional methods, the proposed system offers faster production, improved material utilization, reduced cement consumption, and energy-efficient operation. The developed approach provides a sustainable and technologically advanced solution for modern construction material manufacturing.

Keywords: Hollow Block, Shock Waves, Conical Nozzle, Vicker's hardness, M-Sand and Cement.

Paper Id: A308

SEMANTIC DRIVEN OPTIMIZATION FOR AUTOMATED HIRING SYSTEMS WITH LLM ASSISTED EXPLAINABILITY

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Abstract

Automated recruitment platforms are widely adopted by organizations to manage the increasing volume of job applications generated through digital channels. However, traditional Applicant Tracking Systems (ATS) primarily rely on keyword-based filtering techniques, which often fail to capture the contextual and semantic relationships between candidate profiles and job requirements. This limitation can lead to the exclusion of relevant candidates and reduced efficiency in the hiring process. To address these challenges, this paper proposes a semantic-driven AI framework for intelligent recruitment, integrated with a Domain-Agnostic Recruitment Insights (DARI) module. The proposed system processes resumes and job descriptions from real-time sources, applying preprocessing techniques to extract structured textual information. Semantic similarity between candidate profiles and job requirements is computed using Sentence-BERT embeddings combined with cosine similarity, enabling context-aware matching beyond surface-level keyword overlap. The DARI module enhances the system by extracting and standardizing key candidate attributes, including technical skills, experience, certifications, and project contributions. This domain-agnostic approach ensures consistent evaluation across diverse job roles without relying on domain-specific rules or predefined templates. The extracted features are further utilized in a multi-factor ranking engine that employs a weighted scoring mechanism to evaluate candidates across multiple criteria. To improve transparency and trust, the framework incorporates a hybrid explainability layer that combines SHAP-based feature attribution with large language model-assisted reasoning. While SHAP provides quantitative insights into feature contributions influencing candidate rankings, the language model generates human-readable explanations that justify selection or rejection decisions. The system is evaluated using real-time recruitment scenarios, demonstrating its effectiveness in capturing semantic relevance and generating consistent, interpretable insights compared to traditional keyword-based approaches. By integrating semantic understanding, domain-agnostic analysis, and explainable AI, the proposed framework offers a scalable and practical solution for next-generation intelligent recruitment systems.

Keywords: Semantic Matching, Resume Screening, Skill Extraction, Candidate Ranking, Explainable Artificial Intelligence.

Paper Id: A309

AI Powered Vitamin Deficiency Detection App

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Abstract

Vitamin deficiency is one of the major health issues that is known globally, mostly in the underdeveloped areas where the clinical based diagnosis is constrained. It is important to detect vitamin deficiency early to prevent severe and long-term health complications. This study presents a non-invasive and time saving system that detects vitamin deficiency through image analysis, deep learning and android computing technologies. In this study, the system analysis the images of nails, eyes and tongue which usually reveal observable signs of vitamin deficiency. For mobile use, convolutional neural network (CNN) has been trained on labelled image datasets with TensorFlow Lite. Through TensorFlow Lite, it provides mobile devices with real time evaluation. For secure user authentication and cloud storage, firebase services are utilized. The proposed method helps in early detection, provides nutritional awareness and operates offline in case of network service issues. The system's performance analysis shows that it is suitable for early detection of vitamin deficiency.

Keywords: Vitamin Deficiency, Computer Vision, Convolutional Neural Network, Deep Learning, TensorFlow Lite, Android Application

Paper Id: A310

Multi-Disease Prediction System Using Hybrid Feature Optimization and Multi-Tier Deep Learning

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Abstract

Manual diagnosis of co-occurring diseases is often time-consuming, prone to human error, and lacks interpretability in automated systems. This paper proposes a unified, highly accurate Artificial Intelligence (AI) platform designed for the simultaneous prediction of Heart Disease, Diabetes, and Kidney Disease. The system architecture employs a Multi-Tier Long Short-Term Memory (LSTM) network to capture complex, non-linear health patterns from tabular clinical data. To mitigate the "black box" nature of deep learning and address high-dimensional noise, a Hybrid Feature Optimization pipeline integrating Correlation Matrices, ANOVA, Chi-Square, and Mutual Information was developed to isolate the top critical features for each disease. The model achieved significant testing accuracies, peaking at 97.50% for kidney disease prediction. Furthermore, the platform integrates SHapley Additive exPlanations (SHAP) to provide clinical transparency, generating visual feature-impact graphs that explain individual predictions to medical professionals. To support patient care, an offline Semantic Search module utilizing a BERT-based Retrieval-Augmented Generation (RAG) system delivers secure, hallucination-free health maintenance tips and dietary plans based on the diagnostic output. This integrated approach ensures high accuracy, data privacy via AES-256 encryption, and clinical interpretability, bridging the gap between advanced deep learning and practical healthcare deployment.

Keywords: Multi-Tier LSTM, Hybrid Feature Optimization, Explainable AI, SHAP, AES-256 Encryption, Healthcare Informatics.

Paper Id: A311

THE IMPACT OF THE PERFORMANCE APPRASIAL ON EMPLOYEE'S MOTIVATION

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Abstract:

This study examines the impact of performance appraisal on employee motivation, particularly in service sector organizations where employee performance directly influences service quality. Performance appraisal is an essential human resource management tool used to evaluate employee performance, provide feedback, and support career development. The study focuses on understanding employee perceptions regarding the fairness, transparency, and effectiveness of appraisal systems. Using a quantitative research approach, primary data was collected through structured questionnaires distributed via Google Forms. The findings reveal that performance appraisal has a significant impact on employee motivation, especially when it includes proper recognition, constructive feedback, and growth opportunities. Factors such as work-life balance, supportive leadership, and financial as well as non-financial incentives also play a key role in enhancing motivation.

KEYWORDS: Performance Appraisal, Employee Motivation, Employee Performance Evaluation, Fairness, Effectiveness, Work-Life Balance, Financial Incentives Non-Financial Incentives

Paper Id: A312

.RISK–RETURN EFFICIENCY THROUGH STATISTICAL ANALYSIS: SECTORAL PORTFOLIO OPTIMIZATION OF INDIAN EQUITIES

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Abstract: -

The increasing complexity of financial markets has created a growing need for advanced quantitative techniques to support investment decision-making and portfolio construction. This study investigates the risk–return characteristics and price dynamics of selected equity market variables using statistical and time-series analysis. The dataset consists of 148 observations containing key stock market indicators including trading volume, opening price, high price, low price, daily range, spread, and closing price. The primary objective of the study is to examine the relationships between these market variables and the closing price, while also exploring the temporal dependency of stock prices through lag-based regression models. The analysis employs multiple statistical methods including descriptive statistics, correlation analysis, regression modelling, and time-series techniques. A multiple linear regression model was constructed with closing price as the dependent variable and volume, opening price, high price, low price, range, and spread as independent variables. The results indicate an extremely strong model fit with an R^2 value of 0.999, suggesting that the selected market indicators explain nearly all variations in the closing price. Among the predictors, opening price demonstrated the strongest positive influence on closing price, while spread exhibited a strong negative relationship. To capture time-dependent behavior in stock prices, lag variables were generated and incorporated into an autoregressive regression framework. The lag analysis revealed that previous day price movements significantly influence current closing prices, indicating the presence of temporal persistence in stock market behavior. Additional time-series diagnostics including autocorrelation and partial autocorrelation analyses further support the presence of short-term dependence in the price series. Overall, the findings demonstrate that intraday market indicators combined with lag-based time-series models provide strong explanatory power for stock price movements. The study highlights the usefulness of integrating regression modelling with lag analysis to better understand financial market dynamics and to support data-driven investment strategies.

Keywords: Stock Market Analysis, Regression Analysis, Lag Model, Time-Series Analysis, Financial Econometrics, Risk–Return Analysis, Stock Price Prediction

Paper Id: A313

An Enhanced EfficientNet-Based Deep Learning Approach for Early Pneumonia Detection

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Abstract

Pneumonia is a serious global health issue. It involves lung inflammation and fluid buildup, which requires quick and accurate diagnosis. Chest X-ray imaging is the standard method, but manual interpretation often suffers from high variability among radiologists and complex automation systems. This research presents an automated diagnostic framework using EfficientNet. It uses MBConv blocks to achieve high-precision classification with optimized parameters. The system features a strong multi-stage preprocessing pipeline. Contrast Limited Adaptive Histogram Equalization (CLAHE) improves thoracic contrast, while a Canny Edge Detection module identifies key structural boundaries and infiltrates. A U-Net architecture then performs precise lung segmentation to remove non-pulmonary background noise. To connect model predictions with clinical trust, an SVD-based Class Activation Map (CAM) creates heatmaps of critical areas. Experimental results show excellent performance, with an accuracy of 98.03%, precision of 98.43%, recall of 98.92%, and an F1-Score of 98.67%. This diagnostic method is a user-friendly web application. It allows clinicians to upload images and view automated results and visualizations easily.

Keywords: Deep Learning, Image Processing, Flask Web App, EfficientNet.

Paper Id: A314

NEUROBRIDGE: AN AI-ENABLED IOT SMART GLOVE FOR REAL-TIME GESTURE-TO-TEXT TRANSLATION

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Abstract—Wearable technology has changed how people interact with computers, but there are still limited options to help those who have trouble speaking or hearing communicate. Today’s gesture-recognition systems often use bulky hardware, poorly integrated sensors, or require cloud computing. This creates challenges for real-time translation and daily use. To tackle these issues, this paper introduces NEUROBRIDGE, a smart glove based on the Internet of Things (IoT). It is designed to instantly convert gestures into text using AI and Tiny Machine Learning (TinyML) integrated within it. The goal is to create a cost-effective, portable device with a fast response time that interprets hand gestures for smooth communication. The glove uses Flex sensors and an MPU6050 IMU to track finger bending and hand position in real-time. A microcontroller (ESP32) manages this data. The ESP32 runs a pre-trained TinyML model for on-board analysis, allowing for quick offline classification. In tests, the model reached 92% accuracy with 2,000 training examples, marking a 30% improvement compared to training with fewer samples. The glove transforms common signs into spoken language using an AI-based text-to-speech system, enabling it to “speak” for the user. It can also connect to the Blynk IoT platform, allowing caregivers or family members to monitor it in real-time. The device operates via USB power, making it lightweight, energy-efficient, and suitable for everyday use. NEUROBRIDGE showcases how combining AI, TinyML, and IoT can create valuable tools that enhance access, speed, and inclusion for those who cannot speak. It creates a foundation for future advancements in smart wearable communication systems.

Keywords—Smart Glove, Embedded IOT, Wearable Technology, Artificial Intelligence, Machine Learning, Gesture to Text, Text to Speech

Paper Id: A315

Smart Safety Wears for Industrial Workers

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Abstract

Industrial workers often face dangerous situations like very hot or cold temperatures, harmful gases, and loud noises, which can harm their health and safety. Traditional safety methods usually depend on people checking things manually, which makes it hard to spot dangers quickly as they happen. To fix this, this project introduces a smart safety wearable device that uses the Internet of Things. This wearable keeps watching both the workers' health and the environment all the time. It has several sensors that track things like body temperature, air temperature, moisture, gas levels, and noise. A small computer called an ESP32 looks at the data from the sensors and checks if it goes beyond safe limits. If it does, the device makes a loud sound and shows a message on a screen so the worker can act fast. The system can also send data wireless to a special online place, so managers can check conditions from a distance and decide what to do. This idea is affordable, easy to use, and can be used in many different workplaces. Overall, this smart wearable helps make work safer by giving real-time updates, finding problems early, and helping manage safety better.

Keywords: IoT, Smart Wearable, Industrial Safety, ESP32, Real-Time Monitoring, Sensors, Cloud Monitoring.

Paper Id: A316

Visual AI & Edge Intelligence: On-device Visual AI Platform for Resource-Constrained Environments

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Abstract:- Embedded GPUs are of the type of edge devices. and are single-board computers on the rise. applied upon visual intelligence on demand in applications e.g. surveillance, robotics and smart infrastructure. However, executing deep computer vision based learning models. is a challenge of platform resource constrained. associated with latency and memory footprint and energy. efficiency. In this case, the on-device graphic is provided in this paper. Artificial intelligence platform that would facilitate an efficient real-time. perception of low-power hardware on low-power hardware. NVIDIA Jetson nano and Raspberry Pi. The vision activities are promoted by the proposed model, and human pose estimation, object detection. and identifying anomaly, by a module and. scalable architecture. Lightweight deep learning Optimized models are the ones that are founded on the YOLOX family. by compression of models of the type of quantizing and systematic pruning to attain the strict. computational constraints. Additionally, the system is a dynamic model elective system. that acquires the art of inference, and is demonstrating on the available. homogenous performance, and resource of the device. under varying workloads. An automated deployment refresh of models and edge-side is supported by pipeline integration. This is proven by experimental assessment. that the platform can estimate at low latency with decreased memory loss and spared. challenging validity in recognition, proving it. suitability for applications. real-time edge intelligence

Keywords- Jetson Nano, model, Edge AI. On-device inference, compression, Raspberry Pi. Visual AI, YOLOX.

Paper Id: A317

MOTION AWARE CURSOR INTERACTION WITH MOTION OBJECT

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ABSTRACT

The Motion-Aware Cursor Interaction system provides a touchless and intuitive way to control a computer using a combination of hand gestures and eye-ball movement. The system utilizes computer vision techniques to capture real-time input through a camera and detect user movements. A pre-trained model, MediaPipe, is used for accurate hand landmark detection, while OpenCV processes video frames. By analyzing finger positions, eye movement, and gesture patterns, the system converts user actions into cursor operations such as movement, clicking, dragging, and scrolling.

The integration of both hand gestures and eye-ball movement enhances accessibility, especially for physically challenged users, by providing multiple modes of interaction. The system is designed to be platform-independent, enabling usage across Windows, Android, and iOS devices. It also supports applications in Augmented Reality (AR) and Virtual Reality (VR) environments, offering immersive and natural interaction experiences.

Furthermore, this system promotes touchless and hygienic interaction, making it suitable for public devices such as ATMs, kiosks, and ticket booking machines. Overall, the project provides an efficient, flexible, and innovative solution to improve human-computer interaction in modern and smart environments.

Keywords: Hand Gesture Recognition, Eye Tracking, Computer Vision, Cursor Control, MediaPipe, OpenCV, Human-Computer Interaction, Cross-Platform Systems, AR/VR, Touchless Technology.

Paper Id: A318

The Influence Paradox: A Survey-Based Investigation into the Disconnect Between Influencer Reach and Consumer Purchase Action

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Abstract

Even now, companies spend big on influencers because they believe more views mean more sales. Yet, crowded feeds bring doubt, not trust. Visibility climbs, but people hesitate before buying what they see. What stands in the way? Hidden mental blocks keep interest from becoming action. Behind every scroll, a pause lingers before any click. Numbers grow, yet results stall. A quiet mismatch grows louder each day. Using a survey-based approach targeting active social media users, the study measures variables such as perceived authenticity, frequency of sponsored exposure, and post-exposure purchase behavior. Preliminary findings suggest that while influencers are effective at the awareness stage, their impact diminishes at the conversion stage. Factors such as over-saturation and comment section sentiment act as critical moderators that can halt the purchase process. The study concludes that “Reach” is a vanity metric that does not guarantee ROI, providing a framework for marketers to better predict conversion rates by looking beyond follower counts.

Keywords: Influencers, perceived authenticity, frequency of sponsored exposure, post-exposure purchase behavior, over-saturation, comment section sentiment

PAPER ID: A319

AN ANALYTICAL STUDY ON THE INFLUENCE OF AI TOOLS ON ACADEMIC PRODUCTIVITY OF MBA STUDENTS

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ABSTRACT

Artificial Intelligence (AI) tools are increasingly being integrated into academic environments, offering students new ways to enhance learning efficiency and academic productivity. AI-powered platforms support activities such as research, writing, data analysis, and assignment preparation. Among Master of Business Administration (MBA) students, these tools are widely used for tasks including case study analysis, project development, and academic content creation.

This study aims to analyze the influence of AI tools on the academic productivity of MBA students. The research focuses on examining students' awareness, frequency of usage, and perceived benefits of AI tools in academic activities. The study adopts an analytical research design and collects primary data through a structured questionnaire administered to MBA students. The collected data will be analyzed using statistical techniques such as percentage analysis, mean analysis, correlation analysis, and chi-square tests to examine the relationship between AI tool usage and academic productivity. The findings are expected to provide insights into the role of AI technologies in improving learning efficiency and academic performance among MBA students.

Keywords — Artificial Intelligence, AI Tools, Academic Productivity, MBA Students, Higher Education, Digital Learning.

Paper Id: A320

Evaluating the Financial Impact of Social Media Marketing on Consumer Purchase Decisions

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Abstract

Social media marketing has become an important tool for businesses to reach consumers and influence their buying decisions. With the widespread use of social media platforms in India, consumers across different age groups are increasingly exposed to online advertisements, influencer promotions, and digital offers. This study examines the financial impact of social media marketing on consumer purchase decisions, with a focus on spending behaviour, impulse buying, and budget management. The main objective of the study is to understand how social media marketing affects the financial decisions of consumers, including students, working professionals, and older individuals. By collecting responses from a diverse group of consumers across India, the study aims to present a broad view of how social media influences spending patterns and financial awareness. A quantitative research approach was adopted for the study. Primary data was collected through a structured questionnaire from 100 respondents using convenience sampling. The questionnaire included questions related to social media usage, frequency of purchases influenced by social media, average spending per purchase, unplanned buying, budget overruns, and post-purchase regret. The collected data was analysed using percentage analysis and the Chi-square test to examine the relationship between social media marketing exposure and consumer financial behaviour. The results of the analysis indicate that social media marketing has a noticeable influence on consumer spending decisions. Many respondents reported making impulse purchases and spending more than planned after being exposed to social media advertisements and promotional offers. At the same time, some consumers stated that social media helped them find discounts and compare prices before making purchases. The study concludes that social media marketing plays a meaningful role in shaping consumer financial behaviour in India. The findings highlight the need for greater financial awareness among consumers and responsible marketing practices by businesses.

Keywords: Social Media Marketing, Consumer Purchase Decisions, Financial Impact, Impulse Buying, Chi-Square Analysis

Paper Id: A321

A STUDY ON COMPETENCY MAPPING OF MANAGERIAL AND BEHAVIORAL SKILLS AMONG EMPLOYEES

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ABSTRACT

Competency mapping is now a crucial part of human resource management. This approach aids in determining the precise competencies that workers require to do their jobs effectively. Hiring, training, and performance reviews were the main responsibilities of human resources in the past. However, businesses are beginning to view their workforce as their most valuable asset in the fiercely competitive business environment of today. As a result, there is now more emphasis on helping them reach their full potential. This study looks at key managerial skills such as leadership, decision-making, problem-solving, and planning. The investigation further explores behavioral proficiencies, encompassing communication, collaboration, adaptability, and interpersonal dynamics within the workforce. This research underscores the necessity of pinpointing discrepancies between employees' existing skill sets and the competencies demanded by their respective positions. The effectiveness of these training and development programs in addressing these disparities is demonstrated. Organizations that implement competency mapping methodologies frequently observe enhancements in employee performance, increased productivity, and stronger alignments between individual capabilities and organizational objectives. Moreover, the study posits that continuous learning prospects, consistent feedback mechanisms, and nurturing work environments are crucial for the cultivation of employee competencies. Therefore, by focusing on developing both management skills and behaviors, organizations can create a more skilled, confident, and productive workforce, which in turn supports lasting growth and success.

Keywords: Competency Mapping, Managerial Skills, Behavioral Skills, Employee Performance, Leadership, Decision-Making, Problem-Solving, Communication, Training and Development, Organizational Growth

PAPER ID: A322

IMPACT OF SOCIAL MEDIA MARKETING ON INVESTMENT DECISIONS

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ABSTRACT:

Digital tech has changed financial stuff a lot lately, and social media is right in the middle of it when it comes to how people invest. I think platforms like Twitter, Instagram, YouTube, and LinkedIn are really pulling investors along, both the regular ones and the big institutions. They mess with what people think, how they feel about things, and what they end up doing with their money. It is pretty wild how fast info spreads on these sites now, like trends in investing or what experts say, and it makes everything seem open to more folks. Influencers and analysts post videos or chat live, and that shapes moods around buying or selling. Things like if the source seems trustworthy, how often you see it pop up, or if it hits you emotionally, plus what your friends think, all push choices in one direction or another. User stuff too, like reviews from regular people or those online groups; they guide strategies without anyone planning it that way. Then there is the completely behavioural side, where social media kicks off biases. Herd behaviour, where everyone piles in together, or overconfidence making you think you know it all, and that FOMO thing, fear of missing out, it leads to quick, maybe dumb decisions. Some people see it one way, as if it is all helpful for learning more about finance, but it also brings risks, misinformation floating around, people trying to manipulate markets, and not enough rules watching over it. This study pulls from books and data already out there to look at how social media acts as both a helper and something that shakes things up in investing. It feels like the findings point to needing to check online content carefully, and maybe mix it with basic analysis or charts to balance it out. Social media marketing is just part of decisions now, changing old ways of doing finance, and digital literacy matters more than ever. It seems kind of messy overall. Keywords: Social Media Marketing, Investment Decisions, Investor Behaviour, Financial Influencers, Behavioural Biases, Digital Marketing, Online Investment, FOMO, Market Trends, Financial Literacy.

Paper Id: A323

Industrial Internet of Things in Agriculture: Intelligent Solutions for Modern Farming

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Abstract

The integration of the Industrial Internet of Things (IIoT) into the agricultural sector has established a transformative paradigm for intelligent, connected farming. This research paper evaluates the comprehensive IoT ecosystem, which integrates sensing devices, computing pipelines, and actuators to facilitate data-driven decision-making across the entire farming value chain. By leveraging a continuous flow of time-series data, these systems enable localized weather alerts, precision irrigation, and variable-rate applications of soil treatments. Furthermore, the study explores the application of machine learning and spectral imaging for advanced pest management and crop health monitoring. While technical hurdles such as connectivity standards and security resilience remain, the analysis substantiates that IoT frameworks provide the consistency and operational capability required to enhance global agricultural productivity and resource sustainability.

Keywords: Machine Learning, Data Analytics, Cloud computing, IOT Sensors, Edge Computing.

Paper Id: A324

Decentralized Peer-to-Peer Energy Trading Framework for Efficient Utilization of Distributed Renewable Energy Resources

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Abstract

The increasing adoption of renewable energy sources, particularly solar power, has led to surplus energy generation at the consumer level, which often remains underutilized due to the absence of efficient distribution and trading mechanisms. This paper proposes a decentralized peer-to-peer energy trading framework that enables prosumers to efficiently utilize and trade excess energy within a localized as well as distributed network. The proposed system leverages blockchain technology to ensure secure, transparent, and tamper-proof transactions between participants, eliminating the dependency on a centralized authority and enhancing trust among users. Unlike conventional energy systems where energy meters are limited to recording consumption and require manual intervention for billing and monitoring, the proposed framework incorporates advanced smart metering integrated with Internet of Things (IoT) technology. This enables real-time monitoring of energy generation, consumption, and trading activities through a user-friendly mobile application interface. The system not only facilitates energy exchange among neighboring households but also extends to larger-scale solar installations spread across multiple acres of land, thereby strengthening the concept of decentralization and distributed energy management. Furthermore, the framework introduces automated billing mechanisms that directly communicate energy usage and transaction details to consumers, ensuring accuracy, transparency, and reduced human intervention. The integration of digital platforms allows users to track their energy profiles dynamically, make informed decisions, and optimize their energy usage patterns. By minimizing energy wastage and promoting localized energy markets, the system enhances economic benefits for prosumers while supporting sustainable energy practices. Overall, the proposed decentralized energy trading model contributes to the evolution of smart grid technologies by integrating blockchain, IoT, and real-time data analytics, thereby enabling efficient resource utilization, improved grid reliability, and a scalable solution for future energy demands.

Keywords: Peer-to-Peer Energy Trading, Blockchain Technology, Smart Grid, Renewable Energy, Decentralization, Internet of Things (IoT), Smart Metering, Energy Management

Paper Id: A325

Multi-Model Deep Learning Approach for Alzheimer's Disease Detection

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Abstract

Alzheimer's Disease (AD) affects the brain changing how people behave, think, and remember things. Doctors need to spot it to give patients the right care . Our project suggests a system that uses multiple deep learning models to find AD in brain MRI scans. We picked three popular Convolutional Neural Networks - VGG19, DenseNet121, and SqueezeNet - to pull out key features from the images. Each model has its own way of seeing patterns so using them together makes our results more accurate. We combined their predictions to sort brain scans into different groups: Normal, Mild Cognitive Impairment (MCI), and Alzheimer's Disease. We trained and tested our models on datasets like ADNI and found that our combined approach works better than any single model. This method could help doctors diagnose Alzheimer's Disease earlier and more in real-world medical settings. Keywords— Alzheimer's Disease, Deep Learning, Convolutional Neural Networks (CNN), VGG19, DenseNet121, SqueezeNet, MRI, MultiModel Architecture, ADNI Dataset, Early Diagnosis

Paper Id: A326

Fraud Detection and Digital Payments using Machine Learning

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Abstract

Digital payment systems have made transactions faster and more convenient than ever before. However, as their use continues to grow, so does the risk of fraud, creating serious concerns about security and user trust. This paper explores how machine learning can be used to detect and prevent fraudulent activities in digital payment systems. By analyzing transaction patterns, these technologies help identify suspicious behavior and strengthen trust in digital finance. The approach involves examining various aspects of transactions, such as the amount, time, location, and method of payment. This makes it easier to spot unusual patterns that may indicate fraudulent activity. Common supervised machine learning techniques like Logistic Regression, Decision Trees, and Random Forest are used to classify transactions as either legitimate or fraudulent. Compared to traditional rule-based systems, these models are more flexible and effective at identifying complex fraud patterns. The paper also discusses key challenges such as imbalanced data, false alarms, and privacy concerns. Addressing these issues is essential for building secure and reliable payment systems.

Keywords: Digital Payments, Fraud Detection, Machine Learning, Data Security, Transaction Analysis, Predictive Modeling

Paper Id: A327

A Microcontroller-Based Street Lighting System with Underground Cable Fault Detection And Automatic Power Restoration

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Abstract

Underground cable systems are essential in modern power distribution due to their enhanced safety, reliability, and minimal environmental impact. However, detecting and locating faults such as short circuits, open circuits, and insulation failures remains a significant challenge. This paper presents a microcontroller-based intelligent system for fault detection and isolation in underground cables. The system uses an Arduino controller to monitor the voltage and current using sensors. The location of the fault is calculated using Ohm's law.

A real-time LCD is also included to display the information regarding the type of fault occurring in the cable as well as the location of the fault. The system includes the use of relay to isolate the faulty cable section with the help of a parallel healthy cable to ensure uninterrupted power supply. The system also includes the use of a buzzer to indicate the faults occurring in the cable. Additionally, the system includes the use of a GSM module to monitor the faults remotely. The proposed system is cost-effective and can be easily implemented to improve the accuracy of the faults occurring in the cable system.

Keywords: IoT, Street Light, Fault Detection, Arduino, GSM, Underground Cable

Paper Id : A328

Transformer-Based Mutation Impact Analysis of HIV Proteins with Structure-Aware Biological Validation

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Abstract

Human Immunodeficiency Virus (HIV) exhibits a high mutation rate that significantly contributes to viral evolution, immune escape, and the development of drug resistance. Identifying mutations that have the greatest functional and structural impact is therefore critical for understanding viral adaptation and improving therapeutic strategies. However, many traditional mutation analysis approaches rely primarily on either sequence-based analysis or structural analysis independently, which limits the ability to capture the complete biological significance of mutations. In this study, we propose an integrated computational framework for ranking HIV protein mutations by combining sequence-based deep learning representations with structural network analysis. Mutations are generated in silico from the HIV-1 POL polyprotein reference sequence, and three complementary features are computed for each mutation: an AI-based mutation impact score derived from ProtBERT protein language model embeddings, a structural centrality score obtained from residue interaction networks constructed from protein structures, and a geometric exposure score estimated from spatial neighbor density surrounding mutation sites. A grid search optimization strategy is employed to determine the optimal weighting of these features for mutation ranking. Experimental results show that structural centrality plays a dominant role in identifying biologically important residues, with the optimized model effectively prioritizing mutations located at structurally critical regions of the protein. Structural validation using protein visualization further confirms that several top-ranked mutations occur near functionally significant residues associated with drug resistance. The proposed framework provides a systematic computational approach for prioritizing mutations with potential functional impact in viral proteins and offers a scalable methodology for mutation analysis in rapidly evolving viral genomes.

Keywords : HIV mutation analysis, protein structure networks, ProtBERT embeddings, structural centrality, mutation impact prediction, mutation ranking.

Paper Id: A329

Dual-Modality Alzheimer's Disease Prediction System Using Clinical Data and MRI Analysis

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Abstract

Alzheimer's Disease (AD) is an irreversible neurodegenerative disease that requires an accurate and comprehensive diagnosis at the earliest possible stage in order to effectively treat it. The dual-modality prediction system described in this project combines two separate modules; one for clinical evaluations and the other for MRI evaluations. The clinical component uses a Random Forest classifier and takes into account the demographic information, MMSE scores, and past diagnosis of the person being evaluated. The MRI module uses the same data; however, instead of utilizing a classifier, it analyzes the pattern of brain activity directly from the brain using MRI. As an additional benefit to the combination of the two modules, the project also provided a web application to give patients, clinicians and administrators secure access to the computerized prediction system and a means to input clinical data, upload MRI scans and receive real time predictions. Together, the combination of both modalities will provide a more accurate and reliable prediction and therefore closely resemble the diagnostic processes used in clinical practice. In conclusion, the project illustrates how machine learning can be applied to the health care system, allowing for earlier detection, remote monitoring and integrated analyses of patients with Alzheimer's Disease.

Keywords: Alzheimer's disease, dual-modality prediction, clinical data analysis, MRI image processing, machine learning, Random Forest, pattern-based classification, web-based healthcare system, early detection, medical imaging.

Paper Id: A330

Role of After-Sales Service in Building Brand Loyalty.

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Abstract

In today's highly competitive market, companies can no longer rely only on product quality to attract and retain customers. Instead, they must focus on delivering a strong overall customer experience, especially after the purchase is made. This study examines the role of after-sales service in building brand loyalty among consumers and highlights how post-purchase support influences customer satisfaction, trust, and long-term relationships with a brand. The research is based on primary data collected through a structured questionnaire using Google Forms, with a total of 150 valid responses considered for analysis. A descriptive research design was adopted, and the data was analysed using percentage analysis, descriptive statistics, correlation analysis, and hypothesis testing to understand the relationship between after-sales service, customer satisfaction, and brand loyalty. The study developed and tested multiple hypotheses to examine whether after-sales service significantly affects customer satisfaction, repurchase intention, recommendation behaviour, and brand switching. The findings reveal a strong positive relationship between effective after-sales service and brand loyalty. Customers clearly value factors such as quick issue resolution, reliable warranty services, easy return policies, and responsive customer support. These elements not only improve customer satisfaction but also build trust and encourage repeat purchases. At the same time, the study highlights that poor after-sales service has a negative impact on customer perception and often leads to brand switching. Customers who experience delays, lack of support, or poor service are more likely to move to competing brands and share negative feedback. Overall, the results confirm that after-sales service is not just a support function but a key strategic tool for businesses. Companies that invest in improving their after-sales service can strengthen customer relationships, increase customer retention, and gain a sustainable competitive advantage in the market.

Keywords: After-Sales Service, Brand Loyalty, Customer Satisfaction, Customer Trust, Repurchase Intention, Service Quality, Brand Switching, Customer Experience, Relationship Marketing

Paper Id: A331

Credit Card Fraud Detection Using Machine Learning

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Abstract

Credit card fraud detection systems often rely on transactional attributes such as amount, location, and frequency, while giving limited attention to behavioral signals that indicate user intent and urgency. This project presents a machine learning–based fraud detection framework that enhances decision accuracy and transparency by integrating emotion-aware behavioral risk analysis with an explainable fraud interpretation module. The proposed system introduces a novel Behavior Volatility Score (BVS) to model stress- or panic-driven transactional behavior. This score is derived from patterns such as sudden bursts of transactions, rapid retry attempts, and abnormal transaction timing, which are commonly associated with fraudulent activities but are rarely modeled explicitly. The volatility score is combined with standard transaction features and processed using a sequential learning model based on Long Short-Term Memory (LSTM) networks to capture temporal behavioral deviations effectively. By analyzing feature contributions, the system generates concise explanations such as unusual spending behavior, unexpected timing, or abrupt behavioral changes, enabling both users and financial institutions to understand the model’s decisions. By combining emotion-aware behavioral modeling with explainable decision outputs, the system delivers a more transparent, reliable, and user-centric fraud detection solution suitable for real-world financial applications.

Keywords: Python, Long Short-Term Memory (LSTM), Scikit-learn, SMOTE (Imbalanced Learning), Explainable AI (XAI).

Paper Id: A332

Implementation Of An Embedded Based Wireless Ev-To-Ev Charging System In Remote Areas

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Abstract

The rapid expansion of electric vehicle (EV) technology has significantly contributed to sustainable transportation by reducing greenhouse gas emissions and dependence on fossil fuels. However, the widespread adoption of EVs is still limited by challenges such as inadequate charging infrastructure, long charging times, and range anxiety, particularly in remote and rural areas. Conventional wired charging systems rely on fixed charging stations, physical connectors, and manual intervention, which are often unavailable or impractical during emergency situations. To address these limitations, this paper presents the implementation of an embedded-based wireless EV-to-EV charging system that enables direct, contactless energy transfer between two electric vehicles. The proposed system utilizes Wireless Power Transfer (WPT) technology combined with ESP32 microcontrollers to facilitate intelligent and autonomous power sharing. In this system, one electric vehicle operates as a transmitter while the other functions as a receiver. The receiver vehicle continuously monitors its battery voltage using a DC voltage sensor. When the battery level falls below a predefined threshold, a wireless charging request is transmitted to the donor vehicle through short range communication. Upon receiving the request, the transmitter vehicle activates its WPT circuit, enabling inductive power transfer without any physical cable connection. To ensure safe and reliable operation, the system integrates temperature sensors that continuously monitor the thermal conditions of the battery and charging coils. If abnormal temperature or voltage levels are detected, the charging process is automatically terminated to prevent overheating, overcharging, or component damage. Additionally, a manual control switch is incorporated to provide user initiated control over the charging process. The results indicate that the proposed EV-to-EV wireless charging system is portable, efficient, and practical for real-world use.

Keywords: Electric Vehicle (EV), Wireless Power Transfer (WPT), EV-to-EV Charging (V2V), ESP32, Embedded Systems (ES), Direct Current (DC).

Paper ID: A333

Transformer-Based Medical Image Segmentation with Multi-Scale Token Fusion and Ensemble Optimization

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Abstract:

Medical image segmentation can play a major role in computer-aided diagnosis, especially when lesions are poorly defined, tissue contrast is low, and there are significant anatomical variations. In this work, a deep learning-based framework for automated medical image segmentation using a transformer-based architecture is presented. In the proposed system, a UNETR (UNet with Transformers) architecture is used, which combines a Vision Transformer encoder with a convolutional decoder to effectively capture both global contextual information and fine spatial details. A Multi-Scale Token Fusion (MSTF) mechanism is introduced to enhance feature representation. The features are enhanced by aggregating information across multiple spatial resolutions, improving the model's ability to identify lesions of varying sizes and shapes. To guarantee strong generalisation, the model is trained and evaluated using five-fold cross-validation. Experiments are conducted on the ISIC 2018 skin lesion segmentation dataset, where the framework is evaluated using standard segmentation metrics including Dice Similarity Coefficient, Intersection over Union (IoU), Hausdorff Distance (HD95), and Average Surface Distance (ASD). To improve prediction reliability, multiple predictions from the framework are combined using the Ensemble Fusion Strategies (including mean-based and probabilistic fusion approaches) producing a single consensus segmentation mask. Experimental results demonstrate significant improvement in segmentation accuracy and stability. This ensemble method yields a final Dice score above 0.91. Notably, the entire pipeline was developed and validated on a standard consumer-grade GPU, showing that competitive segmentation performance is achievable without extensive computational resources — an important consideration for practical use in clinical settings.

Keywords: Medical Image Segmentation; Vision Transformer; UNETR; Multi-Scale Token Fusion; Ensemble Techniques

Paper Id: A334

AI Powered Crowd Counting and Anomaly Detection for Public Safety.

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Abstract

This project presents a smart crowd anomaly detection system that integrates artificial intelligence with embedded sensing for real-time crowd monitoring and safety management. The system utilizes a ResNet-based deep learning model combined with a specialized CrowdCNN architecture to analyse live crowd video inputs and detect abnormal movements, density variations, or panic situations. The video feed is processed by the AI model, which sends the analysed data to an Arduino Uno microcontroller for decision execution. An IR sensor is incorporated to count individuals and verify the crowd density in localized zones. The Arduino, upon detecting an anomaly or exceeding threshold limits, activates a relay-driven alert mechanism consisting of a buzzer and visual indicator. The LCD display provides real-time updates on crowd count and system status. This hybrid setup enhances situational awareness and ensures rapid response in public safety applications. The integration of AI-based visual analytics with physical sensor inputs ensures accuracy, scalability, and efficiency. The proposed model can be deployed in smart cities, stadiums, and transportation hubs to prevent accidents and manage emergency situations effectively.

Keywords: Smart Crowd Monitoring, Crowd Anomaly Detection, Deep Learning, ResNet Model, CrowdCNN, Arduino Uno, IR Sensor, Embedded System .

Paper Id: A335

A Web-Based Career Guidance and Application Platform Using Role-Based Access Control

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Abstract

The choice of a career path stands as one of the most important choices which determines a person's entire work life. The absence of correct guidance together with trustworthy information creates difficulties for students who seek jobs and those who want to enter the job market. This paper presents a Career Guidance and Application Platform which has been developed through its design process. The platform helps users to understand their choices better while it makes the application process more efficient. The system creates a user interface which responds to different devices while maintaining its simple and attractive design through the use of HTML and Tailwind CSS and JavaScript. The platform uses Role-Based Access Control (RBAC) as its main security system to provide efficient control over user access rights. The system provides different features to students and mentors and administrators which allow them to receive personalized career advice and track their applications and handle content. The platform provides users with an interactive environment to examine different career paths while they receive valuable information and find job openings. The system achieves security protection through its access control system which maintains user-friendly functions while enabling system expansion. The research demonstrates that online solutions enable organizations to establish career guidance systems which manage job pathways and appointment processes through centralized systems.

Keywords: Role-Based Access Control, Artificial Intelligence, Tailwind CSS.

Paper Id: A336

A Comparative Analysis of Resilience, Burnout, and Work-Family Conflict Among Doctors and Nurses: Implications for Healthcare Workforce Well-being

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Abstract

Healthcare professionals, particularly doctors and nurses, globally face significant occupational stressors that profoundly impact their resilience, contribute to pervasive burnout, and exacerbate work-family conflict (WFC). This paper undertakes a comprehensive comparative analysis of these critical phenomena within the distinctive Indian healthcare context, meticulously drawing insights from an extensive literature review. It delves into the interplay of distinct and overlapping challenges encountered by both medical and nursing professionals, elucidating how the formidable combination of high patient loads, severe resource constraints, and deeply ingrained societal expectations in India intensifies these issues. The meta-analysis synthesizes findings on resilience, positing it as a crucial protective factor; explores the varied manifestations and multifactorial contributing elements of burnout across these professions; and examines the pervasive nature of WFC, frequently amplified by prevailing gender roles. The paper culminates by underscoring the urgent imperative for targeted, systemic, and culturally sensitive interventions to safeguard the holistic well-being of the Indian healthcare workforce, thereby ensuring the sustained delivery of high-quality, compassionate patient care.

Keywords: healthcare professionals, physician burnout, nurse burnout, resilience, work-family conflict, occupational stress, healthcare workforce

Paper Id: A337

Isolation, purification, and phenotypic characterization of epiphytic bacteria from the leaves, bark, and flowers of *Butea monosperma*.

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Abstract

Butea monosperma's is a medical plant that can play vital or various types of roles in the environment according to their favourable conditions , *Butea monosperma* contains anti-bacterial biochemical flavonoids like butein, butin, and isobutrin like phytochemical are involved, chalcones, glycosides, phenolic compounds, tannis, like phytochemical, butein is highly active antibacterial compound. Antibacterial activity of extracted phytochemical that have the ability to inhibit the gram positive bacteria like *Staphylococcus aureus*, and also gram negative bacteria like *Escherichia coli*. *Butea* is a traditional plant it is also popular in the name of plash, tesu, dhaak, plash is generally used by people. It belongs to the family of Fabacea. Isolation is carried by using washing samples, preparation of culturing media like Nutrient Agar (NA). In identification involves morphology observation, rate of growth, gram staining and standard biochemical tests such catalase, oxidase, etc. For further identification in the molecular level we can use 16S rRNA gene sequencing to classify it accurately. Epiphytic bacteria provide protection or health to the plant because they have antimicrobial potential to fight against foreign pathogens or particles, stress tolerance. These types of properties and functional vital roles highlight the importance and potential in the field of agriculture, biotechnology and pharmaceutical research.

Keywords: *Butea monosperma*, Phytochemicals, Antibacterial properties, phenotypic characterization, 16S rRNA sequencing, Applications.

Paper ID: A338

Resilience and Psychological Well-Being in Higher Education: The Mediating Role of Cultural Intelligence

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Abstract

This study examines the relationship between resilience and psychological well-being among university faculty, with a particular focus on the mediating role of cultural intelligence (CQ). Drawing on Conservation of Resources Theory, resilience is viewed as a key psychological resource that may support the development of adaptive capabilities required for functioning effectively in culturally diverse academic environments. A quantitative, cross-sectional design was adopted, and data were collected from 200 faculty members working in private universities. Resilience, cultural intelligence, and psychological well-being were measured using the CD-RISC-10, Short Cultural Intelligence Scale (S-CQS), and WHO-5 Well-being Index. Confirmatory factor analysis indicated that the measurement model demonstrated satisfactory fit and construct validity. Structural equation modelling was employed to examine the proposed relationships, and mediation was tested using bootstrapped confidence intervals. The results showed that resilience was positively associated with both cultural intelligence and psychological well-being, while cultural intelligence was also positively related to well-being. In addition, the indirect association between resilience and well-being through cultural intelligence was significant, indicating partial mediation. The overall model demonstrated an acceptable fit to the data. These findings suggest that cultural intelligence may serve as an important pathway linking resilience to well-being in culturally diverse higher education settings. The study contributes to the literature by providing a clearer understanding of the mechanisms underlying faculty well-being and highlights the importance of integrating cultural competence and resilience-building initiatives within faculty development programs.

Keywords: resilience, cultural intelligence, psychological well-being, structural equation modeling, higher education, mediation

Paper ID: A339

SMART DIRECT TO ROOT IRRIGATION SYSTEM FOR COCONUT TREES

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Abstract

Coconut is one of the major agricultural products in many parts of India. Its planted in many regions of India. The success in coconut tree farming depends in various factors including selection of good quality coconut saplings, preparation of land, planting, irrigation, maintenance and cropping the coconut seeds. Irrigation plays a important roles in the coconut tree requires a substantial amount of water to grow and thrive. Proper management of irrigation is required to ensure the health of coconut plants in different stages of its life cycle. This study discusses smart irrigation solutions for coconut plants. Conventional method of irrigation followed in coconut tree farms is flood irrigation / basin irrigation. Although it's a simple method of irrigation the effectiveness is around 50% as most of the water is absorbed in the troughs of water passage and certain percentage of water is evaporated in the basin. Recent developments include drip irrigation using drip tubes or bubblers which is more effective than conventional methods in effective management of water. In Drip irrigation the drip tubes or bubblers will be exposed and laid above the soil around the coconut tree. Once the tree grows up, coconut and coconut leaves may fall over the drip tubes and possibility of damaging the drip tubes is more. This will result in an increase of maintenance costs and losses to the farmers. Considering the above disadvantages in using the drip irrigation in commercial coconut farms, a new method of subsurface irrigation is developed along with smart systems to monitor and control the irrigation requirements which will reduce the consumption of water to a negligible amount by ensuring the complete utilization of water supplied.

Paper Id: A340

Quantum-AI Hybrid Multi-Ticker Stock Market Prediction and Decision Support System

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Abstract

Stock market analysis platforms today mainly focus on either visualization or standalone prediction models, but rarely combine both with intelligent decision support in a unified environment. Traders often need to switch between multiple tools to compare stocks, analyze indicators, and interpret forecasts, which increases complexity and time consumption. Additionally, traditional machine learning models such as regression or LSTM networks struggle to fully capture the highly non-linear, volatile, and noisy behavior of financial markets. To overcome these limitations, this paper presents a Quantum-AI Hybrid Multi-Ticker Stock Market Prediction System that integrates Quantum Neural Networks (QNN) with Generative AI-driven analytical reasoning. The QNN leverages variational quantum circuits to model high-dimensional feature spaces and identify subtle market patterns that classical algorithms may overlook. Simultaneously, Generative AI enhances the system by providing contextual and fundamental analysis to complement technical predictions. The platform features a unified dashboard where multiple stocks can be visualized and compared side-by-side in real time. A hybrid decision engine processes both quantum technical signals and AI-generated insights to produce clear recommendations such as Strong Buy, Wait, or Avoid. Parallel processing architecture ensures low-latency performance even when analyzing multiple tickers simultaneously. Experimental evaluation indicates improved pattern sensitivity, faster computation, and more actionable decision support compared to conventional stock analysis systems.

Keywords— Quantum Neural Network, Stock Prediction, Multi-Ticker Dashboard, Generative AI, Decision Support.

Paper Id: A341

An Intelligent Mock Interview Platform Using Language Models and Speech Processing

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Abstract

Interview preparation significantly influences a candidate's chances of success in the recruitment process. However, many job seekers lack access to realistic tools that allow them to practice interviews in a structured and personalized manner. This paper presents an AI-based mock interview platform designed to simulate interview scenarios using minimal user input such as job role, technical skills, and years of experience. Based on these inputs, the system generates role-specific interview questions using a generative language model, enabling targeted and practical interview preparation. The platform is implemented using modern web technologies to ensure usability and secure data handling. A major feature of the system is the use of real-time video recording during interview sessions. These recordings are processed using multimodal AI techniques to evaluate both verbal responses and behavioral indicators such as confidence and emotional expression. The system then provides structured feedback to support self-evaluation and improvement. Preliminary testing suggests that users demonstrate improved clarity in responses, greater confidence, and increased awareness of their interview performance after interacting with the system. By removing the need for resume uploads and integrating automated feedback mechanisms, the proposed solution offers an accessible and scalable alternative to conventional mock interview methods.

Keywords: Artificial Intelligence, Mock Interview System, Generative AI, Multimodal Analysis, Interview Preparation.

Paper ID : A342

Real-Time Blood Group Detection for Medical Applications Using Fingerprint and CNN

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Abstract

Blood group identification plays a vital role in medical emergencies, transfusion procedures, and forensic investigations. Traditionally, blood group detection requires invasive laboratory testing methods, which can be time-consuming and dependent on specialized equipment. This paper proposes a non-invasive approach for blood group detection using fingerprint images by leveraging image processing and machine learning techniques. Fingerprints contain unique ridge patterns such as loops, whorls, and arches, which are believed to have a potential correlation with blood group characteristics. The proposed system involves fingerprint image acquisition, preprocessing, feature extraction, and classification. Image enhancement techniques are applied to improve fingerprint clarity, followed by extraction of ridge-based features. These features are then analyzed using a machine learning classifier to predict the corresponding blood group. The model is trained and tested on a labeled dataset to evaluate its accuracy and performance. This approach offers a cost-effective, fast, and non-invasive alternative to traditional blood group testing methods. The study highlights the potential of integrating biometric analysis with healthcare diagnostics for future smart medical systems.

Keywords: Fingerprint Image Analysis, Deep Learning, Convolutional Neural Network (CNN), Image Processing, Feature Extraction, Pattern Recognition.

Paper Id: A343

AI-Driven HR Transformation and Organizational Agility: A Structural Equation Modelling Approach in the Industry 4.0 Context

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Abstract

The rapid advancement of Industry 4.0 technologies, particularly Artificial Intelligence (AI), has significantly transformed Human Resource Management (HRM) practices. This study examines the impact of AI-driven applications on HR digitization and organizational agility, with a focus on Organizational Network Analysis (ONA) and Organizational Design (OD). Five key AI applications-Health and Safety Improvement, Enhancing Employee Comfort, Employee Productivity Measurement, Automating Payroll Processing, and Real-Time Feedback-are considered to evaluate their role in HR transformation. A quantitative research design was adopted, and data were collected from 385 HR professionals across IT, manufacturing, and service sectors in Telangana, India. Structural Equation Modelling (SEM) using AMOS was employed to test the conceptual framework. Reliability and validity were established through Cronbach's alpha, Composite Reliability (CR), and Average Variance Extracted (AVE), all exceeding recommended thresholds. The model demonstrated a good fit ($\chi^2/df = 2.38$, CFI = 0.92, RMSEA = 0.060, GFI = 0.90, AGFI = 0.87). Results indicate that AI applications significantly influence Digitization of HR ($\beta = 0.190$, $p = 0.001$), Organizational Network Analysis ($\beta = 0.251$, $p < 0.001$), and Organizational Design ($\beta = 0.162$, $p = 0.009$). Digitization of HR significantly affects both ONA and OD, while ONA shows the strongest impact on OD. Mediation analysis confirms partial mediation effects. The study highlights the importance of integrating AI-driven HR practices to enhance organizational agility, collaboration, and decision-making.

Keywords: Artificial Intelligence (AI), HRM, HR Digitization, ONA, OD, Organizational Agility, Structural Equation Modelling (SEM), Industry 4.0.

Paper Id: A344

‘YODHA’ - AI-Powered Intelligent Border Operations Management System for Situational Awareness and Resource Optimization

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Abstract

In remote and difficult areas like mountains, deserts, and deep forests, border security operations necessitate effective resource management, real-time situational awareness, and quick decision-making. Employees stationed in these regions frequently deal with challenging natural circumstances, inadequate infrastructure, and weak connectivity, which makes ongoing coordination and monitoring challenging. They rely on a variety of technologies, including as drones, cameras, ground sensors, and satellite imagery, to maintain efficient surveillance. Nevertheless, these systems produce enormous volumes of data that are challenging and time-consuming to manually assess, raising the possibility of missing threats or delayed reactions. This project suggests creating an AI-powered operational management system to deal with these issues. In order to analyze data in real time, the system combines data from multiple monitoring sources and employs cutting-edge methods like computer vision and machine learning. It allows for quicker and more precise reactions by automatically identifying trends, anomalies, and possible risks. By producing real-time alerts and offering useful insights to aid in decision-making, the system improves situational awareness. Additionally, by giving priority to key warnings and supporting predictive maintenance to guarantee equipment dependability and operational preparedness, the platform enhances resource usage. The suggested method greatly improves border security operations in remote and dangerous locations by reducing manual labor, minimizing human error, and integrating intelligent automation with real-time analytics.

Keywords: Artificial Intelligence, Border Security, Situational Awareness, Threat Detection, Resource Optimization, Smart Automation.

Paper Id: A345

Electric Vehicle Charging Station Management System

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Abstract:

The rapid growth of electric vehicles (EVs) has created a strong demand for intelligent and efficient charging infrastructure. This project presents the design and development of a Smart Electric Vehicle Charging Station Management System, which integrates both hardware and software components, with a major focus on software-driven control and monitoring and supporting hardware implementation. The hardware section consists of an ESP32-based controller integrated with voltage, current, and temperature sensors to measure real-time charging parameters. These components ensure safe energy transfer and provide essential data for system operation. The software plays a dominant role by enabling real-time monitoring, automatic control of charging and discharging, cost calculation, and safety management. The system continuously analyses sensor data to detect abnormal conditions such as over-voltage, over-current, and over-temperature, and takes immediate action to protect the battery and charging system. It also calculates energy consumption using standard electrical formulas and determines the charging cost automatically, improving transparency for users. This solution addresses key limitations of conventional charging stations, such as lack of monitoring, manual billing, and absence of safety mechanisms. The proposed system enhances operational efficiency, ensures safe charging, reduces energy wastage, and provides a user-friendly platform for both operators and EV users. Overall, the project demonstrates how IoT-based software intelligence combined with minimal hardware can create a smart, reliable, and scalable EV charging management system.

Paper Id: A346

Intelligent Biomedical Waste Sorting: Enhancing Safety in Healthcare Systems

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Abstract

Effective management of biomedical waste in hospitals is crucial because it directly affects public health, environmental protection, and infection prevention. Failing to properly separate medical waste can result in dangerous exposure, a higher likelihood of disease spread, and breaches of safety regulations. This paper introduces the creation of a smart automated system designed to enhance the segregation of biomedical waste in healthcare settings. The system employs real-time image processing and classification based on Convolutional Neural Networks (CNN) to detect and sort various waste types, such as infectious, recyclable, and general waste. Once classified, the system facilitates correct disposal by granting access to the appropriate bin, ensuring precise segregation without the need for manual handling. The system is crafted to offer an intuitive user experience, where individuals simply present the waste item and receive an automated directive for its proper disposal. Experimental assessments show dependable classification performance across different conditions. By reducing human involvement, the system lowers contamination risks and enhances adherence to biomedical waste management standards, thereby promoting safer and more efficient healthcare environments.

Keywords: Biomedical Waste Management, Convolutional Neural Network (CNN), Image Processing, Automation, Embedded Systems, Smart Healthcare, Waste Segregation

Paper id A347

Time Series AQI Prediction Using BiLSTM with Seasonal and Health Risk Analysis

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Abstract

Air pollution has become a major environmental and public health issue in rapidly growing urban areas. Cities in Tamil Nadu, including Chennai, Coimbatore, Salem, Tiruchirapalli and Madurai are experiencing increasing pollution levels due to traffic congestion, industrial activities and urban expansion. Seasonal factors such as summer, monsoon and winter further influence pollutant concentration, making accurate prediction challenging.

This study proposes a machine learning-based approach for Air Quality Index (AQI) prediction and seasonal analysis using real-time and historical data collected from the WAQI platform. The dataset includes key parameters such as PM2.5, PM10, SO2, O2, temperature and humidity. A Bidirectional Long Short-Term Memory (BiLSTM) model is implemented for time series prediction, as it captures both past and future dependencies in data. Other models such as LSTM, Support Vector Regression (SVR), XGBoost and ARIMA are also used for comparison.

Model performance is evaluated using RMSE and R² score. Results show that the XGBoost model achieves superior accuracy (92%-98%) compared to other models. Additionally, seasonal analysis and a health risk assessment module for asthma prediction enhance the practical applicability of the system.

Keywords: Air Quality Index (AQI), BiLSTM, XGBoost, Time Series Prediction, Seasonal Analysis, Asthma Risk

Paper Id: A348

IOT Based BATTERY MANAGEMENT SYSTEM WITH CHARGE MONITORING AND FIRE PROTECTION.

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Abstract

The rapid growth of electric vehicles (EVs) and energy storage systems has made lithium-ion batteries indispensable, yet their susceptibility to overcharge, deep discharge, cell imbalance, and thermal runaway continues to pose serious challenges to safety and longevity. This project develops a comprehensive Battery Management System (BMS) that integrates precise charge monitoring with robust fire protection mechanisms to enhance battery reliability, extend cycle life, and mitigate fire hazards in high-power applications. Charge monitoring is achieved through real-time acquisition of key parameters: individual cell voltages via high-accuracy ADCs, pack current using shunt resistors or Hall-effect sensors, multi-point temperatures with NTC thermistors, and state of charge (SoC) estimation employing coulomb counting combined with open-circuit voltage correction and Kalman filtering for improved accuracy under dynamic conditions. The system prevents overvoltage and undervoltage conditions by enforcing strict cut-off thresholds, actively balances cells using passive or active equalization circuits to minimize voltage drift, and implements adaptive charging algorithms that modulate current based on temperature, SoC, and internal resistance estimates. These features optimize energy utilization, reduce capacity fade, and provide reliable sSOH feedback to the user or vehicle controller. Fire protection focuses on early detection and containment of thermal runaway—a cascading exothermic process triggered by abuse conditions. The BMS employs layered safeguards: high-resolution temperature monitoring to identify hotspots (>5°C/min rise triggers alert), overcurrent/overvoltage protection with MOSFET-based disconnects for millisecond response, and optional gas sensors (e.g., for CO, H₂, or volatile organics) to detect electrolyte decomposition prior to venting. Upon anomaly detection—such as abrupt voltage collapse, excessive current draw, or rapid temperature escalation—the system initiates progressive responses: visual alarms, charge/discharge interruption, forced cooling activation cell isolation via contactors, and full pack shutdown to arrest propagation. Predictive elements analyze parameter trends to forecast risks, enabling preemptive intervention. By fusing accurate charge oversight with proactive thermal and hazard mitigation, this BMS significantly improves operational safety, regulatory compliance, and user confidence in lithium-ion battery deployments for EVs and stationary storage.

Paper Id: A349

SMART GREEN HOUSE WITH CLIMATE CONTROL AND PLANT DISEASE DETECTION

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Abstract

Environmental factors and plant health play a critical role in agricultural productivity and are difficult to manage in traditional farming practices. Under greenhouse conditions, the environment is controlled, but traditional greenhouses are highly dependent on manual observation and intervention that often results in waste of resources and a delay in response to unfavorable conditions. This paper, we have described the design and implementation of a smart greenhouse system that incorporates IoT-based climate monitoring along with ML based plant disease detection to improve crop productivity and sustainability. The system constantly monitors environmental parameters like temperature, humidity, soil moisture, light intensity, and CO₂ from the sensor network. The control system responds to real-time sensor measurements, and automated actions are performed by actuators which include irrigation pumps, ventilation fans, lighting system, and exhaust units to ensure target conditions. In addition, a camera-based plant disease detection module is incorporated by applying CNN to process leaf images and detecting common plant diseases at an early stage. The system is connected to the cloud which allows for remote monitoring, data visualization, and alert notifications via a web-dashboard. Experimental results demonstrate that the proposed method minimizes manual intervention, maintains environmental stability and early disease detection. The proposed smart greenhouse system is an affordable and scalable platform for precision agriculture applications.

Keywords: Smart Greenhouse, Internet of Things, Climate Control, Plant Disease Detection, Convolutional Neural Network, Precision Agriculture.

Paper Id: A350

GREYWATER TREATMENT USING BIO-FILTER MEDIA FOR SUSTAINABLE WATER REUSE

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ABSTRACT

This project focuses on the design and development of an efficient greywater treatment system using low-cost and eco-friendly filter media. Greywater generated from domestic sources such as bathrooms, kitchens, and washing areas contains suspended solids, organic matter, and dissolved impurities, which require proper treatment before reuse. The proposed system utilizes a multi-layer filtration process consisting of coarse aggregate, activated carbon, and natural materials such as neem powder to improve water quality. Each layer plays a significant role in removing physical, chemical, and biological contaminants. The system is designed based on gravity flow, ensuring low energy consumption and easy operation. Experimental analysis was carried out to evaluate parameters such as pH, turbidity, Total Dissolved Solids (TDS), and Biological Oxygen Demand (BOD). The results indicate a significant reduction in pollutants, demonstrating the effectiveness of the filtration system. The treated water can be reused for non-potable applications such as irrigation and cleaning. This project highlights a sustainable and cost-effective solution for water conservation, especially in areas facing water scarcity. The system is simple to construct, requires minimal maintenance, and can be implemented at both household and community levels.

Paper Id: A351

Deep Learning Framework for Multistage Diabetic Retinopathy Detection and Integrated Patient Monitoring

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Abstract

Diabetic Retinopathy (DR) stands as one of the main reasons which diabetes patients to lose their ability to see. The risk of severe vision impairment needs continuous monitoring, which requires early diagnosis, especially in rural areas that lack access to specialized eye care facilities. This research establishes a deep learning system which detects Diabetic Retinopathy in different stages through the analysis of retinal fundus images. The Convolutional Neural Network (CNN) system classifies retinal images into five different severity levels which include No DR Mild Moderate Severe and Proliferative DR. The system provides automated classification functions together with healthcare support modules which include dietary guidance for different stages and eye exercise recommendations and hospital location services for users who need eye care facilities. The web-based platform provides organized patient record systems which allow continuous tracking of patient health and disease development. The experimental results show that the system achieves dependable multi-class classification results which were measured through accuracy and precision and recall and F1-score metrics. The proposed framework offers a scalable and cost-effective solution for early DR screening and integrated patient monitoring.

Keywords: Diabetic Retinopathy, Convolutional Neural Network, Retinal Fundus Images, Multistage Classification, Medical Image Analysis, Patient Monitoring, Geolocation Services.

PAPER ID : A352

Digital Entrepreneurship in the Age of E-Commerce: Opportunities and Challenges for Emerging Businesses

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Abstract

Digital entrepreneurship is being reshaped by the rapid expansion of e-commerce, lowering barriers for new ventures while intensifying competitive and operational pressures. This abstract examines the core opportunities and challenges shaping emerging digital business. On the opportunity side, e-commerce reduces traditional barriers to entry by providing access to global customers, low cost digital infrastructure, data-driven customer insights, and scalable models such as direct-to consumer, market place selling, and social commerce. It also examines persistent challenges, including platform dependence and algorithm volatility, rising customer acquisition costs, trust and reputation management, cybersecurity and fraud, logistics and returns complexity, and evolving tax and regulatory requirements across borders. Drawing on current trends in digital platforms and consumer behavior, the study argues that long-term success increasingly depends on differentiation, resilient fulfillment and customer service capabilities, and responsible data governance. The topic concludes with implications for entrepreneurs and policy makers seeking to support sustainable, inclusive growth in the digital economy.

Key words - Entrepreneurship, E-Commerce

Paper Id: A353

Data Over-Collection in Mobile Applications: Do Apps Really Need What They Take?

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Abstract

Mobile applications often collect more user data than they actually need to work properly. This problem is known as data over-collection and can create risks for user privacy. In this study, we examine different mobile apps to understand whether the data they collect is necessary for their main functions. We compare what the app does with the permissions it asks for. Based on this, we group data into three types: essential, optional, and excessive. Our results show that many apps collect extra data that is not required, often for advertising or tracking purposes. We also suggest a simple method to identify unnecessary data collection and improve transparency for users.

Paper Id: A354

Dual-Response Smart Freshness Indicator Strip Using Stabilized Anthocyanins from Red Cabbage and Hibiscus for Packaged Foods

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Abstract

Intelligent packaging systems have gained increasing importance due to the limitations of traditional expiry-date labeling in accurately reflecting food freshness in real time. Natural anthocyanins exhibit pH-responsive colorimetric sensing properties; however, their practical application is limited by environmental instability. In this work, stabilized anthocyanins extracted from red cabbage and hibiscus were utilized to develop a dual-response smart freshness indicator strip for packaged foods. The system integrates two sensing zones: Zone-1 consisting of a stabilized chitosan–red cabbage anthocyanin biofilm, and Zone-2 comprising a filter-paper-based hibiscus anthocyanin indicator. UV–visible spectroscopy confirmed strong pH-responsive optical behavior with a distinct absorption peak at 524 nm. Under acidic, neutral, and alkaline conditions, both anthocyanin systems exhibited distinct pH-induced color transitions, demonstrating visually distinguishable changes with ΔE values greater than 5. Stabilization of anthocyanins was achieved using sorbitol (1.5% w/v), sodium citrate (0.1% w/v), and tannic acid (0.05% w/v). The Zone-1 biofilm was successfully fabricated using solvent casting and exhibited clear color transitions from pink (acidic) to purple (neutral) and greenish-yellow (alkaline) corresponding to structural transformations of anthocyanin molecules with pH variation. The complementary dual-zone design enhances sensitivity toward volatile amines generated during food spoilage, enabling accurate visual freshness monitoring. This economical, biodegradable, and food-safe system provides a practical approach for real-time freshness monitoring of highly perishable packaged foods such as fresh meat products and chopped vegetables.

Index Terms —Smart packaging, Anthocyanin, Freshness indicator, Colorimetric sensing, Intelligent food packaging, Volatile amines.

Paper Id: A355

Machine Learning Models for Latest Technological Ecosystems

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Abstract

Early and accurate skin cancer detection remains a critical challenge in dermatological healthcare, where delayed diagnosis significantly worsens patient prognosis. This paper introduces SkinGuard Pro, an image processing powered skin cancer detection framework leveraging EfficientNetB0 a highly efficient convolutional neural network derived through Neural Architecture Search combined with transfer learning for accurate multi-class dermoscopic lesion classification. The system is trained and validated on the HAM10000 dataset, encompassing seven clinically significant skin lesion categories. A two-phase training strategy is adopted, beginning with frozen convolutional feature extraction followed by selective fine-tuning for domain-specific adaptation. To address severe class imbalance, a blended per-class decision threshold mechanism is implemented alongside class-weighted cross-entropy loss. Clinical transparency is achieved through Grad-CAM, generating pixel-level saliency overlays that spatially attribute classification decisions to specific lesion regions. A complementary automated ABCDE clinical rule analyzer provides a rule-based corroboration layer grounded in established dermatological criteria. The complete system is deployed as a Flask-based RESTful web application, enabling real-time browser-accessible diagnostic support. Experimental evaluation demonstrates a classification accuracy of 87.6% and conventional SVM baselines. The paper presents the system architecture, training methodology, explainability validation, and clinical utility analysis in detail.

Keywords: *Skin Cancer Detection, EfficientNetB0, Transfer Learning, Grad-CAM, ABCDE Rule, HAM10000, Deep Learning, Dermatoscopy, Flask Deployment, Class Imbalance.*

Paper id: A356

A Multi-Stage Deep Learning Framework for Automatic Bacterial Colony Detection and Counting in Microbial Images

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Abstract

The counting of bacterial colonies is a time-honored microbiological procedure that is required in clinical diagnostics, food safety analysis, and pharmaceutical research. Conventional manual colony count techniques are both time-consuming and labor-intensive, and subject to human error, particularly when there is a situation of overlapping colonies and a colony growing in dense formation. In a bid to overcome such drawbacks, this work provides a new deep learning-based architecture of automated detection and count of bacterial colonies on microscopic and agar plate images. The suggested model combines highly developed image preprocessing, segmentation networks and object detection mechanisms to enhance the counting accuracy in bad illumination conditions and in different colony concentrations. First, image pre-processing tools are used to enhance the visibility of the colonies by use of contrast analysis, noise removal and edge detection. After that, a U-Net-based segmentation network is used to precisely separate colony areas with the ground. An object detection model based on YOLOv5 is applied to achieve strong colony detection and counting. Besides this, density based estimation with CSRNet is also introduced to deal with thick clusters of colonies which may be difficult to identify individually. The suggested framework is tested on AGAR image data and evaluated based on various performance metrics. The results of the experiments prove that the given approach is characterized by a high counting accuracy and much better performance when it comes to the colony detection than the traditional image processing and machine learning techniques. The suggested automated system has offered an effective and dependable approach to large-scale analysis of microbes in biomedical and laboratory set ups.

Keyword: Microorganisms, Microbial Images, Segmentation, Object Detection, Density Map, and Bacterial Colony Counting.

Paper ID A357

Diversity patterns of woody vegetation in Shenduruney Wildlife Sanctuary, southern western ghats, India

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Abstract

Tree diversity along elevational gradients is understudied in the Western Ghats. For enumerating tree diversity of Shenduruney WLS we used a stratified design of seven 200-m elevation band and placed 25 plots (20 m × 20m) in each band. We analysed community data in R using the vegan package for diversity and dissimilarity metrics and constructed the regional phylogeny with V.PhyloMaker using the GBOTB backbone (GBOTB.extended) for phylogenetic analyses. Species richness peaked at mid-elevations, with the highest counts in the 400–600 m and 600–800 m bands (140 and 145 species, respectively), and declined toward the highest band (>1200 m, 39 species). Bray–Curtis dissimilarity showed increasing turnover with elevational separation, adjacent bands have moderate dissimilarity (≈ 0.386 – 0.536), while the greatest turnover occurs between the lowest and highest zones (≈ 0.973), indicating strong species replacement across the full gradient. Faith's phylogenetic diversity (PD) mirrored richness, reaching maxima in mid-elevation bands and declining at upper elevations, indicating that mid-elevation assemblages capture a disproportionate share of evolutionary history. Mean pairwise phylogenetic distance (MPD) was remarkably stable across bands (~ 237 – 240), suggesting a consistent deeper phylogenetic breadth among co-occurring taxa along the gradient. By contrast, mean nearest taxon distance (MNTD) varied substantially the highest MNTD occurred at the highest elevations (≈ 90.1), while lower values were observed in some mid-elevation bands (≈ 60.9 – 75.5), implying greater tip-level isolation of high-elevation species and tighter terminal clustering in certain mid-elevation assemblages. Phylogenetic species variability (PSV) remained high across the gradient (~ 0.87 – 0.884), indicating communities retain broad evolutionary representation. Standardized effect sizes revealed non-random structure in specific bands. SES_MPD was significantly negative in the 200–400 m band (≈ -2.25), consistent with phylogenetic clustering. Overall, our results demonstrate a clear mid-elevation peak in both taxonomic and phylogenetic diversity in Shenduruney WLS, consistent with environmental heterogeneity and overlapping biogeographic influences at intermediate elevations.

Paper Id: A358

Vision Assist: Your Personal Eye in the Digital World

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Abstract

The Vision Assist website utilizes real time object detection along with audible feedback to help persons with visual disabilities become aware of their spatial context. Essentially it is a cloud based object recognizer that utilizes the devices cameras, deep learning, computer vision and sound feedback to translate the visual information into meaning full audio suggestions, and to assist with orientation so persons can move around independently. Vision Assist is an incredible way to address on of the biggest accessibility issues, it takes a poorly defined deeply engrained visual awareness issue and context and reduce it into a very simple sound. The technology behind Vision Assist is on the inexpensive side, and the configuration of the system can be customized to meet the needs of the user with a visual blindness or disability. Vision Assist employs a deep learning object detection method called YOLOv3, (you only look once), and the 3 just means it is the third version and demonstrates a great trade-off between speed and detection rate. YOLOv3 has the ability to detect and classify multiple object in one frame at a very fast rate; therefore, it makes it very suitable for real time detections in all sorts of mobile applications. The YOLOv3 model can detect objects from 80 classes. Using OpenCV, the model performs an object detection, with every frame of video data.

Keywords— Object Detection, YOLOv3, OpenCV, Real-Time Object Recognition, Text-to-Speech (TTS), pyttsx3, Django Web Application, Smart Assistance, Real-Time Processing.

Paper Id: A359

MRI-Based Brain Tumor Classification using ResNet-18 with Web Application

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Abstract

Brain tumor identification using magnetic resonance imaging (MRI) has become an important research area in medical image analysis because accurate early-stage detection directly supports treatment planning and patient management. ResNet-18 In this work, a web-based automated brain tumor classification framework is proposed using the ResNet-18 deep learning architecture to categorize MRI brain images into four classes: glioma, meningioma, pituitary tumor, and normal brain images. Before classification, all MRI images undergo preprocessing operations including resizing and normalization to maintain input consistency during model training. The selected ResNet-18 model performs hierarchical feature extraction through residual learning, allowing efficient classification of tumor patterns while maintaining computational simplicity. The trained network is evaluated using test MRI samples, and model performance is assessed through classification accuracy and confusion matrix metrics. Experimental observations indicate that the system can effectively distinguish between multiple tumor categories with stable prediction capability. A user-accessible diagnostic interface is implemented using Streamlit to allow MRI image upload and immediate prediction output. Based on the predicted tumor category, the system also generates treatment suggestions through a predefined clinical recommendation module. This integrated approach provides an intelligent support tool for preliminary brain tumor assessment. Future work may focus on segmentation-based tumor localization and improved clinical decision support using advanced explainable deep learning methods.

Keywords: Brain Tumor Classification, MRI, ResNet-18, Deep Learning, Web Application, Treatment Recommendation

Paper ID:A360

Hybrid Deep Learning-Based Network Intrusion Detection System Using LSTM Autoencoder and XGBoost Classifier

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Abstract

Network security has always been unpredictable. As attackers become more advanced, traditional intrusion detection systems that rely on known signatures and fixed rules struggle to keep pace; they cannot catch threats they have never encountered. Machine learning provides a more flexible solution. It allows a system to learn what normal traffic looks like and raises an alarm when something appears out of place, rather than waiting to recognize a familiar pattern. This paper introduces an AI-Powered Security Operations Center (SOC) Intrusion Detection System based on this concept. The system uses two models in parallel. First, an LSTM Autoencoder learns the normal patterns of network traffic and highlights anything it cannot reconstruct accurately. Second, a Dense Neural Network Classifier identifies the type of attack from 33 categories, using the CICIDS 2017/2018 dataset. Instead of relying on either model independently, their results are combined into a single risk score. This approach allows the system to detect threats that one model might overlook. Alerts are categorized into four severity levels so that analysts can prioritize what is most important, avoiding confusion from countless similar warnings. A live dashboard integrates these functions, displaying real-time traffic events, confidence scores, anomaly trends, and severity breakdowns. Every alert receives a unique incident ID and a response deadline to keep investigations organized. The paper also addresses practical challenges of implementing this system in real-world settings and outlines future steps, including explainability through SHAP values and drift detection to ensure the models remain accurate as network behavior evolves.

Keyword: Intrusion Detection System, Machine Learning, Deep Learning, LSTM Autoencoder, Dense Neural Network, Anomaly Detection, Network Security, Attack Classification, Security Operations Center, Risk Scoring, Real-Time Monitoring, CICIDS Dataset, Incident Response, SHAP Explainability, Concept Drift Detection.

Paper Id: A361

Cloud-Based Medical Dashboard for Clinical Laboratory Management

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Abstract

In modern healthcare systems, efficient management of clinical data is essential for ensuring accuracy, timely reporting, and improved patient outcomes. Traditional paper-based and fragmented digital systems often lead to data redundancy, human errors, and delays in report generation. This paper presents the design and implementation of a cloud-based Medical Dashboard that streamlines the complete clinical laboratory workflow. The proposed system integrates patient registration with unique Outpatient (OP) identification, dynamic laboratory test parameter configuration, and detailed observation recording across multiple medical disciplines such as Hematology, Biochemistry, Serology, and Hormone Analysis, all within a single unified platform. A key feature of the system is its intelligent analytics module, which provides real-time visualization of clinical metrics, test frequency distributions, and patient activity trends using interactive charts and statistical summaries. This empowers healthcare providers to make data-driven clinical decisions effectively. Additionally, the system includes an automated report generation module that produces standardized, professionally formatted, printer-ready PDF reports using jsPDF, significantly reducing manual transcription effort and administrative workload. Data portability is further supported through multi-format export capabilities in CSV and Excel formats using ExcelJS. The application is developed using Next.js 15 with the App Router for a high-performance, responsive frontend, TypeScript for type-safe logic implementation, and Supabase as a secure and scalable cloud backend powered by PostgreSQL. The authentication layer employs bcrypt-based password hashing combined with Next.js middleware for route-level access control, ensuring that sensitive medical records remain protected. The system is deployed on Netlify with continuous integration, providing reliable uptime and seamless updates. By automating and digitizing the complete laboratory lifecycle — from initial patient registration to final report delivery — the proposed system improves operational efficiency, eliminates data inconsistency, and supports the broader digital transformation of clinical environments.

Keywords: Medical Dashboard, Healthcare Management System, Cloud Computing, Laboratory Information System, Clinical Data Analytics, Automated Reporting, Next.js, Supabase, TypeScript, PostgreSQL.

Paper Id: A362

AI-Based Zero Waste Supply Chain Management System

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Abstract

Efficient supply chain management plays a critical role in ensuring the smooth flow of products from suppliers to customers while maintaining optimal inventory levels. However, many supply chain systems suffer from inefficiencies such as inaccurate demand forecasting, poor inventory monitoring, lack of real-time analytics, and ineffective stock management. These issues often result in serious problems including overstocking, stock shortages, product expiration, and increased operational waste. Such inefficiencies not only affect business profitability but also contribute to environmental waste and resource mismanagement. Therefore, developing intelligent systems that can monitor inventory and predict demand is essential for achieving sustainable and waste-free supply chain operations. To address these challenges, this project proposes an AI-Based Zero Waste Supply Chain Management System designed to improve inventory visibility, enhance demand forecasting accuracy, and minimize product wastage through intelligent data analysis and automated monitoring. The system integrates multiple datasets including sales data, inventory data, product expiry information, and supplier logistics data to analyse stock availability and track product movement across the supply chain. By combining these datasets, the system is able to provide a comprehensive view of supply chain activities and support better inventory planning and decision-making. Machine learning techniques are applied to analyse historical sales patterns and forecast future demand for products. In this project, a Linear Regression-based demand forecasting model is used to estimate product demand based on historical sales data and trends. The predicted demand values are compared with current stock levels to detect potential overstock or understock situations. Based on this comparison, the system automatically classifies products into different risk levels such as High Risk, Medium Risk, and Low Risk. This risk classification helps supply chain managers quickly identify items that require immediate restocking, inventory adjustment, or waste prevention strategies. To support user interaction and system monitoring, a web-based dashboard interface is developed using HTML, CSS, and JavaScript. The dashboard provides a user-friendly platform where users can manage product information, monitor inventory levels, and view analytical insights related to supply chain performance. Visual analytics such as charts, graphs, and statistical summaries are used to present important metrics including risk distribution, stock availability, and waste reduction indicators. These visualizations help users understand inventory patterns and make informed decisions regarding stock management. In addition to monitoring and forecasting, the system also generates intelligent recommendations such as reorder suggestions and stock optimization alerts. These recommendations assist organizations in maintaining optimal inventory levels, preventing excess stock accumulation, and reducing the chances of product expiry and waste. Overall, the proposed AI-based system demonstrates how Artificial Intelligence, Machine Learning, and Data Analytics can be integrated with supply chain operations to create a more sustainable and efficient inventory management framework. The implementation of such intelligent systems can significantly reduce operational waste, enhance resource utilization, and support environmentally responsible supply chain practices. This project highlights the importance of adopting smart technologies to move toward zero-waste inventory management and sustainable supply chain development.

Keywords: Artificial Intelligence, Supply Chain Management, Inventory Optimization, Demand Forecasting, Machine Learning, Linear Regression, Waste Reduction.

Paper Id: A363

Reimagining Insurance in the Algorithmic Economy: AI, Risk, Ethics, and Customer-Centric Financial Innovation

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Abstract

The insurance business is emerging as an area of transformation, with the rapid growth of the algorithmic economy redefining the interplay between marketing and finance. The insurance business is adopting traditional risk analysis paradigms to forecasting with the help of AI, ML, and big data analysis tools. The current study aims at exploring the influence of AI-enabled technologies on the marketing strategies and financial operations of the insurance business. The financial operations of the insurance business may include automated claims management, forecasting risk analysis, real-time underwriting, etc., with the help of AI-enabled technologies, thereby increasing the precision of the decision-making process of the business. The marketing operations of the insurance business may incorporate the ability of AI-enabled technologies to facilitate omnichannel consumer interaction with the help of hyper-personalization. Nevertheless, there are significant administrative and ethical concerns with the incorporation of algorithmic systems, which include algorithmic bias, data privacy, and opaque decisions made using algorithms. These issues have significant implications for compliance, brand reputation and consumer trust. The study provides a conceptual framework that incorporates risk control using AI and customer-centric marketing innovation using concepts derived from behavioural science, digital marketing, and financial technology. It includes three important factors that are essential for sustainable growth: adaptability, ethical accountability, and personalization. The study contributes to the discussion on emerging trends in business today by exploring the perspectives of finance and marketing.

Keywords: Artificial Intelligence, InsurTech, Digital Marketing, Customer-Centric Innovation, Risk Analytics, Behavioural Marketing, Financial Technology, Ethical AI, Modern Trends in Finance & Marketing.

Paper Id: A364

FISHERMEN TRACKING AND COMMUNICATION USING WIRELESS WATER COMMUNICATION

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Abstract

Fishermen unknowingly crossing international maritime borders is a serious problem faced in coastal regions. This leads to arrest, loss of boats, financial problems, and risk to fishermen's lives. To overcome this issue, we propose a project titled "Fisherman Tracking and Communication using Wireless Water Communication." The main objective of this system is to monitor the real-time location of the fishing boat and provide automatic alert and safety control when the boat approaches or crosses the predefined border. The proposed system uses a GPS module to obtain the boat's current latitude and longitude. These coordinates are continuously sent to the microcontroller, where they are compared with the stored border location using geofencing logic. If the boat remains inside the safe zone, the system works in normal mode. When the boat crosses the border limit, the system immediately activates multiple safety actions. An alert buzzer is turned ON to warn the fisherman locally, and an LCD display shows the warning message. At the same time, a GSM module with SIM card sends an SMS alert containing the boat location to the control room and boat owner. Additionally, a relay module is used to automatically switch OFF the boat motor as a preventive measure. The fisherman can restart the motor, but the system will repeatedly generate alerts while remaining in the border area. This project provides an effective safety and monitoring solution for fishermen. It helps to reduce accidental border violations and improves communication between fishermen and authorities. In future, the system can be enhanced using satellite or LoRa communication for long-distance deep sea monitoring.

Keywords: Fishermen Tracking, GPS module, Geofencing, GSM Communication, Border monitoring, SafetyAlert System.

Paper Id: A365

VOLTAGE MICRO-GRID

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Abstract

The increasing demand for reliable, efficient, and sustainable electrical energy has led to the development of residential low voltage micro-grids. This project focuses on the design and implementation of a restructured residential low voltage micro-grid that integrates distributed energy resources such as solar photovoltaic systems, energy storage units, and conventional grid supply. The proposed system aims to enhance energy efficiency, ensure uninterrupted power supply, and reduce dependency on centralized power generation. The micro-grid architecture is designed to operate in both grid-connected and islanded modes, providing flexibility and resilience during grid disturbances. Advanced control strategies are implemented to manage power flow, maintain voltage stability, and optimize energy utilization among connected loads. The restructuring approach involves intelligent load prioritization, demand-side management, and incorporation of smart metering technologies. Simulation and practical implementation results demonstrate improved reliability, reduced transmission losses, and cost-effective energy management. The proposed system also supports the integration of renewable energy sources, thereby contributing to environmental sustainability and reduced carbon emissions. This work highlights the potential of restructured residential micro-grids as a viable solution for future smart energy systems. The global transition toward sustainable energy has necessitated a fundamental shift in how residential electricity is distributed and managed. Traditional centralized power systems are increasingly strained by rising demand and the intermittent nature of renewable energy integration. This project addresses these challenges through the design and implementation of a restructured low-voltage (LV) micro-grid specifically engineered for residential clusters. By decentralizing the power structure, this micro-grid enhances local energy autonomy and provides a robust framework for modern urban electrification. The core design of the proposed micro-grid integrates distributed energy resources (DERs), primarily focusing on solar photovoltaic (PV) arrays and advanced battery energy storage systems (BESS). Restructuring the conventional LV framework involves the deployment of smart power electronic interfaces and bi-directional converters that allow for efficient energy flow between sources and domestic loads. This architecture ensures that the residential unit can operate both in grid-connected mode and as a self-sustaining island during utility outages or peak pricing periods. Central to the implementation is an intelligent energy management system (EMS) that utilizes localized control algorithms. This system monitors real-time consumption patterns and environmental data to prioritize load shedding and storage charging. By optimizing the dispatch of stored energy, the restructured micro-grid minimizes reliance on the primary utility grid, significantly reducing electricity costs for residents. Furthermore, the control strategy incorporates voltage and frequency regulation to maintain high power quality across all connected households. The methodology employed in this study includes rigorous simulation modeling followed by a physical prototype implementation. Simulations were conducted to analyze the micro-grid's response to various load profiles and fault conditions, ensuring the stability of the restructured bus system. The physical implementation demonstrates the practical feasibility of the design, showcasing the seamless transition between operating modes. Results indicate a marked improvement in energy efficiency and a reduction in carbon footprint compared to traditional residential supply methods. In conclusion, this research provides a scalable and replicable blueprint for the implementation of restructured LV micro-grids in residential areas. The findings highlight the critical role of smart-grid technologies in alleviating grid congestion and enhancing the reliability of the local power supply. As urban environments continue to evolve, the adoption of such decentralized energy systems will be vital for achieving long-term energy security and environmental sustainability. This project stands as a significant contribution to the field of smart residential infrastructure.

Paper Id: A366

Design, Static Structural and Steady-State Thermal Analysis of a Piston using ANSYS Workbench

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Abstract

The performance and reliability of an air-powered engine significantly depend on the structural integrity of the piston, which is subjected to repeated pressure loading during compressed air operation. Unlike internal combustion engines, air-powered engines operate under relatively lower temperatures; however, the piston must still withstand cyclic air pressure, frictional forces and mechanical stresses during continuous operation. This project focuses on the design and numerical evaluation of an aluminum alloy piston used in an air-powered engine using ANSYS Workbench. A steady-state thermal analysis is first performed to determine the temperature distribution arising from combustion heat transfer and cooling effects. The resulting temperature field is then coupled to a static structural analysis to evaluate the induced thermal stresses, deformation, and stress concentration zones under peak gas pressure loading. Material properties, boundary conditions, and realistic operating parameters are applied to simulate actual engine conditions. The study identifies the critical regions of the piston and assesses its suitability for safe operation through stress comparison with allowable limits. The integrated thermal–structural approach provides a comprehensive understanding of piston behavior, enabling design optimization for improved durability, efficiency, and engine performance.

Keywords: Piston Design, Steady-State Thermal Analysis, Static Structural Analysis, Finite Element Analysis (FEA), Compressed Air Technology

Paper Id: A367

Geospatial Technologies and Artificial Intelligence in Biological Disaster Management: A Comprehensive Review of Risk Mapping and Disease Surveillance Applications

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Abstract:

Global health security is constantly confronted with biological disasters that may arise through vectors or emerging biological agents. In this review article, the possibility of utilising Remote Sensing, Geographic Information Systems, and the latest technology in this area of Remote Sensing and GIS, namely Geospatial Artificial Intelligence, for the prediction of the spread of biological hazards will be explored. The reviewed articles will cover publications between 2018 and 2026. The reviewed articles will focus on the spread of malaria, dengue, chikungunya, leptospirosis, cholera, and COVID-19. RS technology provides vital environmental data required to identify vector habitats and the driving forces of transmission, using satellite imagery. GIS integrates various data sets with epidemiological data during the analysis process. Machine learning can be added to the GIS system, which improves the risk assessment process. This review provides a summary of major approaches, data, and applications that guide integrated geospatial disease surveillance, along with opportunities and obstacles that this emerging field faces. It focuses on the potential for remote sensing, geographic information systems, and GeoAI to act as effective tools in real-world applications for bio-disasters.

Keywords: Remote Sensing, Geographic Information Systems, GeoAI, Biological Disasters, Vector-Borne Diseases, Risk Mapping, Disease Surveillance, COVID-19

Paper Id : A368

Neuro-Symbolic AI for Real-Time Multimodal Surveillance with Vision, Audio, and Temporal Reasoning

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Abstract

Security cameras and surveillance systems are already widespread in metropolitan areas, but the intelligence behind them has found it challenging to keep up with the complexity of actual threats. The majority of current systems operate independently, with a camera monitoring motion and a microphone concentrating for noise, but neither one completely understands what is taking place in a scene. One of the most urgent issues in automated surveillance is still the gap between meaningful interpretation and raw detection. The surveillance paradigm presented is based on the notion that several perspectives are necessary for properly understanding a danger. The system creates a more comprehensive view of events than any single model could by integrating optical object detection, human action recognition, and audio event classification into a single pipeline. The YOLO V11 model has been trained to detect the indicators of physical harms and threats like weapons, firearms, fire, or even accidents. Along with this, a SlowFast Network trained on the RWF-2000 dataset is also integrated to detect actions indicating violent behaviour. Simultaneously, a YAMNet-derived audio model scans the sound environment for alarming signals like gunshots, screams, and siren activity using overlapping time windows. What distinguishes this work from prior efforts is the layer that sits above these models. Rather than passing raw confidence scores to an operator, the system converts detection outputs into structured symbols and feeds them through a rule-based reasoning engine. The resulting alerts carry traceable justifications — a flag for armed assault, for instance, emerges from the co-occurrence of fighting behaviour, a detected weapon, and a gunshot sound, not from a single opaque prediction. Tests on real surveillance footage confirm that fusing these modalities reduces missed detections and false alarms, while the reasoning layer makes the system's conclusions auditable and trustworthy for security personnel acting on time-sensitive information.

Keywords : Multimodal Learning, Intelligent Surveillance Systems, Object Detection, Action Recognition, Audio Event Detection, YOLO, SlowFast Networks, YAMNet, Symbolic Reasoning

Paper Id: A369

Personalized Career Path Recommendation System

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Abstract: Many students and job seekers face significant challenges in selecting an appropriate career path due to a lack of proper guidance, insufficient awareness about industry requirements, and limited understanding of their own skills, interests, and capabilities. In many cases, individuals rely on traditional career counselling methods, which often provide generalized suggestions that are not tailored to individual needs. These approaches fail to consider personal preferences, evolving technological trends, and dynamic job market demands. As a result, many individuals end up choosing careers that may not align with their strengths, leading to dissatisfaction and limited professional growth. To address these issues, this project proposes a Personalized Career Path Recommendation System that aims to provide intelligent, data-driven, and customized career guidance. The primary objective of this system is to help users make informed decisions about their career paths by analyzing multiple aspects of their profile and aligning them with suitable career opportunities. The system is designed to bridge the gap between academic learning and industry expectations by offering precise and relevant recommendations. The proposed system collects and processes various types of user data, including academic background, technical and soft skills, personal interests, certifications, achievements, and career goals. By integrating and analyzing this information, the system constructs a comprehensive user profile. This profile is then evaluated using advanced data analysis techniques to identify potential career paths that best match the user's abilities and aspirations. Machine Learning plays a crucial role in the functioning of this system. Techniques such as classification algorithms and recommendation models are used to analyze patterns in the data and predict suitable career options. The system is trained using datasets that contain information about different career roles, required skills, and industry trends. Based on this training data, the system can effectively match user profiles with relevant career paths, ensuring accurate and meaningful recommendations. In addition to recommendation capabilities, the system also performs skill gap analysis, which helps users understand the difference between their current skill set and the skills required for their desired career. This feature enables users to identify areas for improvement and take appropriate steps to enhance their competencies. Furthermore, the system suggests relevant courses, certifications, and learning resources that can help users bridge these gaps and achieve their career objectives. The system is implemented as a web-based application using technologies such as HTML, CSS, and JavaScript, ensuring ease of access and user-friendly interaction. Users can register on the platform, input their profile details, and receive personalized career recommendations in real time. The interface is designed to be simple and intuitive, allowing users to easily navigate through different features and understand the insights provided. Moreover, the system provides detailed analytics, including recommended job roles, required skill sets, career progression paths, and learning suggestions. This comprehensive guidance helps users not only choose a suitable career but also plan their journey towards achieving long-term professional success. By continuously updating the system with new data and trends, it remains relevant and adaptable to the changing demands of the job market. The proposed system demonstrates how intelligent data analysis and personalized recommendation techniques can significantly improve career decision-making processes. It empowers students and job seekers by providing them with clear direction, actionable insights, and structured guidance. By focusing on individual strengths and industry requirements, the system ensures that users are better prepared for the competitive job market. In conclusion, this Personalized Career Path Recommendation System serves as an effective decision-support tool that enhances career planning and development. By offering customized recommendations, identifying skill gaps, and suggesting improvement strategies, the system helps users achieve their professional goals. Ultimately, it contributes to better career satisfaction, improved employability, and long-term growth by aligning individual potential with the right career opportunities.

Paper Id: A370

Miniaturized Patch antenna with DGS for IoT and Wireless applications

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Abstract

This project focuses on the design of a compact patch antenna that operates at 5.8 GHz, specifically developed for modern IoT and wireless communication devices. To improve its overall performance, a Defected Ground Structure (DGS) is incorporated into the design, which helps enhance bandwidth and minimize interference. The antenna is built on a thin substrate with a thickness of just 1 mm, making it lightweight and suitable for compact applications. Despite its small size of $60 \times 60 \times 3 \text{ mm}^3$, it is capable of delivering a gain of 3.2 dB, ensuring efficient signal transmission. Due to its compact form factor and reliable performance, the antenna can be effectively used in devices such as wireless routers, portable electronics, and various IoT systems. Overall, this design achieves a good balance between size, performance, and reduced electromagnetic interference, making it a practical solution for next-generation wireless communication technologies.

Paper Id: A371

Strengthening of Self Compacting R.C.C Beam using Steel Fibres

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Abstract

Natural river sand is expensive due to excessive cost of transportation from natural sources and also large-scale exploitation of these sources creates environmental problems. In such situations, the Manufactured Sand (M-Sand, which is made by crushing hard granite stones into fine aggregates) can be an economic alternative to the river sand and which is cost effective. This study presents the behaviour of self compacting concrete (SCC) using M-Sand and Steel fibres in Reinforced Concrete Beam (R.C.C). Viscosity Modifying Agent used in this project is Glenium B233. Dosages of Viscosity Modifying Agent (VMA) are to be found out using fresh concrete tests of SCC (Slump flow test, V-Funnel test and L-Box test) and the dosage of VMA was found to be 0.4% of total weight of cement content. M30 concrete mix ratio is adopted using IS code book 10269. Totally 5 No's of R.C.C Beam (2 No's of R.C.C Control beam and Remaining 3 No's of R.C.C beam along with addition of 0.2% of Steel fibre, 0.4% of Steel fibre and 0.6% of Steel fibre) is to be casted and tested after 28 days of curing. All the R.C.C beams are tested for their ultimate strengths and flexural strength of the beams. The flexural behaviour of Self Compacting R.C.C beams is to be studied by using Load (VS) Deflection graph. Experimental result shows that, Self compacting R.C.C beam containing 0.4% of Steel fibre beam possess 14.5% higher flexural strength compare to SCC control beam and also addition of 0.2% and 0.4% of steel fibre increases load carrying capacity of 30% when compared with S.C.C control beam.

Keywords: Viscosity Modifying Agent (Glenium B233), Flexural strength, Fresh Concrete test for SCC, Steel fibres, Compressive strength test.

Paper Id: A372

Design and Structural Analysis of a Wheel Rim Using ANSYS Workbench

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Abstract

Automobile wheel rims are critical to vehicle safety and performance, enduring complex static and dynamic loads resulting from braking, cornering, and road irregularities. As the automotive industry shifts toward improved fuel efficiency and reduced emissions, the demand for lightweight yet structurally sound rims has intensified. However, aggressive weight reduction must be carefully balanced with structural integrity to prevent stress concentrations, excessive deformation, and fatigue failure. This paper presents a comprehensive analysis of the structural behavior of wheel rims using finite element methods. A detailed 3D model of a wheel rim, including the hub and spoke regions, is developed using CAD software and analyzed through ANSYS Workbench. Static structural analysis is conducted to evaluate stress distribution, equivalent elastic strain, and total deformation under realistic radial loads, with particular focus on the hub and spoke-hub junctions. The study further presents a comparative assessment of three materials—steel, aluminum alloy, and magnesium alloy—highlighting their respective trade-offs between weight savings and structural performance. The findings confirm that finite element analysis (FEA) serves as an essential tool for material optimization, ensuring that modern lightweight designs remain within safe permissible stress limits. Key benefits, existing challenges, and future directions in the structural analysis of wheel rims are also discussed.

Keywords: Finite Element Analysis, ANSYS Workbench, Wheel Rim, Static Structural Analysis, Material Optimization, Lightweight Design, Aluminum Alloy, Magnesium Alloy, Stress Distribution.

Paper Id: A373

DEEPAKE DIGITAL MEDIA FORGERY DETECTION USING CONVOLUTIONAL NEURAL NETWORK

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Abstract

Deepfake technology has rapidly evolved with the advancement of artificial intelligence and deep learning techniques. These technologies enable the creation of highly realistic manipulated images and videos that are often difficult for humans to distinguish from genuine media. While deepfakes can be used for creative purposes in film production and entertainment, they also pose serious threats such as misinformation, identity theft, and digital fraud. Therefore, developing automated systems to detect manipulated media has become an important research problem. This paper proposes a deepfake detection system using Convolutional Neural Networks (CNN). The system extracts frames from videos, performs face detection, and analyzes spatial features using a trained CNN model to classify the media as real or fake. Experimental observations indicate that CNN-based approaches provide reliable and accurate detection performance when compared with traditional digital forensic techniques.

Paper Id: A374

Design and Comparative Study of 6T and 9T SRAM Cells using 90nm CMOS Technology in Cadence Virtuoso

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Abstract

This work presents the design and evaluation of a conventional 6T SRAM cell using 90 nm CMOS technology in the Cadence Virtuoso environment, followed by the proposal and analysis of an improved 9T SRAM cell architecture. The 6T cell, consisting of cross-coupled inverters and access transistors, serves as the baseline for assessing read stability, write ability, leakage power, and static delay margins. Detailed simulations—including transient, DC, and corner analyses—highlight the inherent limitations of the 6T structure, particularly its vulnerability to read disturbance and degraded delay at lowered supply voltages. These findings motivate the need for an enhanced SRAM design suitable for modern low-power applications. To address these challenges, a 9-transistor SRAM (9T SRAM) model is proposed and implemented using the same 90 nm technology. The 9T cell incorporates a fully isolated read port, thereby improving read stability and reducing dynamic power consumption. Comparative analysis between the 6T and 9T designs demonstrates that the proposed 9T SRAM achieves significant improvements in read delay, write margin, and standby leakage without imposing excessive area overhead. The results validate the 9T architecture as a promising alternative for robust, low-power on-chip memory in advanced VLSI systems.

Keywords: SRAM, 9T SRAM, CMOS, Low Power, Read Stability, Cadence Virtuoso

Paper Id: A375

Taxonomic and Diversity Analysis of Bacterial Communities in Landslide-Affected and Unaffected Soils of Puthumala, Wayanad, Kerala: Assessing the Impact of the Disaster on Community Structure

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Abstract

Landslide impact-related studies typically consider parameters related to human life and property. Such studies, when done in the environmental dimensions, focus mainly on the floral aspects. But, from a restoration perspective, a detailed evaluation of the soil organisms, especially the microbial communities, is of utmost importance, as they play a pioneering and pivotal role in the ecosystem recovery of landslide-affected areas. Bacteria, being the most abundant among the soil microbes, are vital for this restoration process. The present study was conducted in the 2019 landslide-affected area in Puthumala, Wayanad, Kerala. In this study, 16S rRNA gene amplicon sequencing of soil bacterial communities in landslide-affected areas, in comparison with adjacent unaffected sites, revealed a significant alteration in community composition, particularly within the head region of the landslide. Many beneficial bacteria that were present in the unaffected area were absent in the head region and got replaced in the main body region. Both the landslide-affected soils showed a considerable presence of contamination-related groups. Head region harboured several pathogenic and opportunistic bacteria also. Main body region hosted bacteria that indicated its recovering nature. Since natural recovery of landslide-impacted ecosystems is an extremely slow process, artificial restoration techniques are better suited for reclaiming those ecosystems. Knowing the biological health of the soil in terms of its microbial composition can highly aid in framing artificial restoration strategies.

Keywords: Landslide, Soil bacteria, 16S rRNA gene amplicon sequencing, Taxonomy analysis, Diversity analysis, Restoration

PAPER ID 376

PROMPTLENS AN AI BASED PROMPT OPTIMIZATION AND VISUALIZATION TOOL

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Abstract:

Prompt Lens is an AI-based prompt optimization and visualization tool developed to improve the quality and effectiveness of interactions with large language models. The system systematically analyzes prompt–response pairs using a set of linguistic and semantic evaluation metrics, including relevance, clarity, coherence, creativity, conciseness, and emotional neutrality. These metrics enable a structured assessment of how well a prompt guides the model toward accurate and meaningful responses. By combining natural language processing techniques with transformer-based language models, Prompt Lens generates targeted optimization suggestions that help users refine prompts for improved performance. In addition, the system presents intuitive visualizations that allow users to compare prompt effectiveness across different models and metrics. Experimental analysis demonstrates that the proposed approach enhances prompt quality assessment accuracy while maintaining transparency and interpretability, making it suitable for real-world AI development, research, and deployment scenarios. The system includes iterative learning. Users can adjust prompts based on earlier feedback and see improvements over time. This cycle of evaluation and refinement encourages experimentation. It also helps users gain a better understanding of prompt design strategies. By pointing out problems like ambiguity, redundancy, or lack of specificity, Prompt Lens helps users create clearer and more effective prompts. This ultimately raises the quality of AI-generated outputs.

Keywords: prompt, optimization, NLP Techniques, Efficiency,

Paper Id: A377

Smart Chatbot for College Enquiries

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Abstract

Smart Chatbot for College Enquiries has emerged as a transformative solution in the modern academic environment, enabling institutions to automate repetitive student interactions and deliver instant, accurate information through intelligent conversational systems. With the rapid digitization of educational services and the increasing demand for round-the-clock information accessibility, web-based chatbot systems play a pivotal role in bridging the communication gap between students and administrative staff. Traditional query handling through manual counters and email-based systems results in significant delays, high staff workload, and limited availability outside office hours. This paper presents the design and development of a Smart Chatbot System built to handle college-related enquiries such as admission procedures, course details, fee structures, and placement information. The system employs a web-based interface developed using Angular for real-time user interaction, a Spring Boot backend for efficient query processing and API management, and an Oracle PL/SQL database to store and retrieve predefined FAQ responses and chat logs. A keyword-based matching engine forms the core of the chatbot logic, enabling the system to identify student query intent and deliver relevant responses with minimal latency. The proposed system automates repetitive administrative tasks, significantly reduces manual workload, and provides centralized FAQ management with scalable architecture suitable for academic institutions of varying sizes. Experimental results demonstrate improved response efficiency and enhanced student experience through 24×7 availability. The system further lays the groundwork for future integration of Artificial Intelligence and Natural Language Processing techniques for smarter, context-aware conversational capabilities.

Keywords: Smart Chatbot, College Enquiries, Angular, Spring Boot, Oracle PL/SQL, FAQ Management, Natural Language Processing, Web-Based System.

Paper Id: A378

Cloud Computing: Security Challenges and Solutions

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ABSTRACT

Cloud computing is now one of the most widely used technologies in modern information systems. Organizations use cloud platforms to store information, run applications, and manage computing resources because these platforms provide scalability, flexibility, and cost-effective solutions. However, as more companies move their services and sensitive data to cloud environments, security concerns have increased significantly. If appropriate security mechanisms are not applied, confidential information stored in the cloud may become vulnerable to various cyber threats. This research aims to analyze the main security challenges present in cloud computing and discuss possible solutions to address them. Some of the most common issues include data breaches, weak access control systems, insecure APIs, data loss, and insider threats. These security problems may affect both cloud users and cloud service providers. To strengthen security in cloud environments, several techniques can be applied such as implementing strong authentication mechanisms, encrypting sensitive data, enforcing secure access control policies, performing continuous monitoring, and using effective identity management systems. Technologies including multi-factor authentication, encryption algorithms, and intrusion detection systems play an essential role in protecting cloud resources. The findings of this study indicate that understanding security risks and applying proper security practices can greatly improve the reliability and safety of cloud systems. By integrating multiple protection strategies, organizations can safely adopt cloud computing while ensuring the security of their sensitive data.

Paper Id: A379

NewGenCode-AI-Driven Legacy Code Modernization Platform

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Abstract

Many industries still use legacy systems that were written in languages like COBOL and FORTRAN, but it is getting harder and harder to update or keep them running. This is mostly because the syntax is old, there isn't enough good documentation, and fewer and fewer developers know how to use these languages. This paper presents NewGenCode, an AI-driven multi-agent system aimed at streamlining and automating the modernization of legacy code. The system uses a group of specialized agents to handle different parts of the transformation process. The Analyzer Agent looks at the old code and figures out how it works and what it does. The next step is the Documentation module, which turns the information that was taken out into clear, easy-to-understand descriptions. The IR Generator Agent then changes this into an intermediate representation that doesn't depend on language, which makes it easier to work with. The next step is for the Translator Agent to change the code into modern programming languages like Python, Java, C, and C++, depending on what is needed. Finally, the Debugger Agent makes sure that the code it made is free of errors and works as it should. NewGenCode makes updating old code more efficient, accurate, and scalable by breaking the process down into smaller, easier-to-manage steps. This method cuts down on manual work while keeping the program's original logic, making it easier for businesses to move to modern software environments. NewGenCode makes updating old code more efficient, accurate, and scalable by breaking the process down into smaller, easier-to-manage steps. This method cuts down on manual work while keeping the program's original logic, making it easier for businesses to move to modern software environments.

Keywords: Legacy Code Modernization, Multi-Agent System, IR Generator.

Paper Id: A380

PRANARING – Smart Ring Integrated with Yoga Wellness App

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Abstract

PRANARING is an IoT-based wearable health monitoring system designed to promote digital wellness and preventive healthcare through continuous real-time tracking of essential physiological parameters. The proposed system aims to develop a compact and portable smart ring device embedded with biomedical sensors such as MAX30102 and LM35 to measure heart rate, blood oxygen saturation (SpO₂), and body temperature. The collected data is processed using a microcontroller and transmitted wirelessly to a mobile application through Bluetooth Low Energy (BLE) technology. A dedicated mobile application developed using Flutter and Firebase provides real-time visualization, cloud storage, and historical analysis of health data through an interactive dashboard. Unlike conventional fitness trackers, the system is specifically oriented toward yoga and wellness awareness by offering basic health insights and encouraging relaxation and breathing practices. The complete system integrates smart ring hardware, wireless communication, and a mobile application platform to deliver an affordable, user-friendly, and efficient health monitoring solution. Experimental results demonstrate accurate sensor readings, stable connectivity, minimal transmission delay, and reliable performance, achieving an approximate accuracy of 92% in monitoring vital parameters. This project highlights the practical application of IoT in personal healthcare, with future scope for additional sensor integration, improved battery life, and advanced health analytics to further enhance wellness management.

Keywords: IoT, Smart Ring, Health Monitoring, Wearable Device, BLE, Flutter

PAPER ID : A381

UTILIZING DEEP LEARNING TECHNIQUES FOR THE PREDICTION AND ANALYSIS OF AGRO COMMUNITIES

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ABSTRACT

The Agro Community Connections (ACC) is an innovative online platform designed to support farmers, plant activists, and gardening enthusiasts by promoting sustainable agriculture and strengthening community engagement. It addresses key challenges such as the lack of effective communication, limited awareness, and insufficient resource-sharing tools among users, while also overcoming the inefficiencies of traditional, time-consuming farming methods. By integrating advanced technologies like AI-powered soil nutrient analysis, deep learning, and IoT-based soil condition monitoring, the platform enables users to optimize soil health, improve crop productivity, and adopt sustainable practices. Additionally, ACC offers a user-friendly app experience with minimal setup steps, an engaging garden discovery interface featuring high-quality images and detailed information, secure and convenient payment options, and comprehensive guidance on garden access, resource availability, and maintenance—ultimately fostering a greener, healthier, and more connected agricultural community.

Paper Id:A382

AI-Based Automatic Attendance System Using Real-Time Face Recognition

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Abstract

Traditional attendance management systems in educational institutions are often manual, time-consuming, error-prone, and susceptible to proxy attendance. These limitations reduce reliability and increase administrative overhead. To overcome these challenges, this work presents a scalable, product-oriented AI-based automatic attendance system that achieves greater than 99% accuracy through real-time face recognition, intelligent automation, and secure system design. The proposed system follows a well-defined and user-centric workflow. It begins with department selection (IT, CSE, AI & DS, ECE, EEE, Civil, Mechanical) to ensure structured data organization. This is followed by a secure role-based authentication mechanism, where teachers log in using mobile number and date of birth, and students authenticate using register number and date of birth. Upon successful login, users are directed to a dynamic, role-specific dashboard designed for efficient interaction and usability. The student dashboard provides comprehensive academic visibility, including profile details (photo, name, register number, year, department) and real-time attendance percentage tracking. It also supports leave request submission with automated email notifications and enables downloading of individual attendance reports for transparency. The teacher dashboard facilitates streamlined academic operations by allowing input of subject code, selection of year and semester, and attendance recording based on date and period. The core innovation of the system lies in its AI-powered attendance module, which eliminates manual intervention. When attendance is initiated, the system activates the device camera to capture a real-time group image. Advanced deep learning techniques are employed for multi-face detection, facial alignment, and high-precision recognition, enabling accurate mapping of detected faces to registered student identities. The system is optimized to perform reliably under diverse environmental conditions such as varying lighting, angles, and occlusions.

To enhance security and prevent fraudulent practices, the system integrates anti-spoofing (liveness detection) mechanisms that effectively block attempts using photographs, videos, or digital manipulation. The application is implemented using Flutter to deliver a responsive, cross-platform mobile interface with an intuitive user experience. The backend is powered by FastAPI, ensuring high-performance API communication, seamless AI model integration, and low latency processing. A robust and scalable PostgreSQL database is utilized for secure data storage and efficient data management. Additionally, the system supports real-time notifications via email and mobile alerts, enhancing communication between students and faculty. Unlike conventional academic prototypes, this solution is engineered as a deployable, cloud-ready product, emphasizing scalability, modular architecture, security, and ease of maintenance. The integration of artificial intelligence with automated workflows significantly reduces manual effort, eliminates attendance fraud, and improves operational efficiency. This system demonstrates the potential of AI-driven solutions in transforming traditional educational processes into smart, reliable, and fully automated systems.

Keywords : AI-Based Attendance System, Face Recognition, Deep Learning, Computer Vision, Automated Attendance, Smart Education System, Real-Time Monitoring, Multi-Face Detection, Role-Based Authentication, Flutter Mobile Application, FastAPI Backend, PostgreSQL Database, Cloud-Ready Architecture, Secure Authentication, Digital Attendance Management, Intelligent Automation.

Paper Id: A383

AI- POWERED BANK ASSISTANT FOR AUTOMATED FORM FILLING & TOKEN GENERATION

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Abstract

The increasing demand for efficient and user-friendly banking services has highlighted the limitations of traditional in-branch processes, particularly in areas such as manual form filling and queue management. Customers often encounter difficulties in understanding complex banking forms, performing repetitive data entry, and enduring long waiting times, which collectively lead to errors, delays, and reduced service efficiency. To address these challenges, this paper proposes an AI-Powered Bank Assistant designed to automate and streamline core banking interactions. The AI Powered Bank System integrates Artificial Intelligence techniques with image-based data processing and voice-driven user interaction to provide an intelligent and accessible solution. The system enables users to capture images of their passbooks, from which essential information such as customer name, account number, branch details, and IFSC code are automatically extracted and validated using Optical Character Recognition (OCR). A voice-assisted interface further enhances usability by guiding users through the process, collecting additional transaction-related inputs, and resolving ambiguities in real time. Based on the verified data, the system performs automated form filling, thereby minimizing manual effort and significantly reducing the likelihood of human errors. Upon user confirmation, a digital token is generated to manage service flow within bank branches, effectively reducing queue congestion and waiting time. The system is designed with a focus on usability, accuracy, and efficiency, making it particularly beneficial for elderly individuals, rural populations, and users with limited literacy. The proposed solution demonstrates how intelligent automation can transform traditional banking operations into a more efficient, inclusive, and user-centric service model. By combining data extraction, voice interaction, and process automation, the AI-Powered Bank Assistant enhances customer experience while improving operational performance in banking environments.

Keywords: AI, NLP, OCR, Voice Assistant and Digital Token.

Paper Id: A384

Where Is My Bus? – A Real-Time Bus Tracking Web Application

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Abstract:

The rapid growth of urban populations and the increasing dependence on public transportation systems have created a strong need for efficient, reliable, and real-time transit solutions. One of the major challenges faced by daily commuters is the lack of accurate information regarding bus locations and arrival times. Passengers often experience uncertainty, long waiting times, and inconvenience due to delays or schedule changes. To address these issues, the project titled “Where Is My Bus – Web Application” is proposed as a smart and user-friendly solution for real-time bus tracking and management. This web-based application is designed to provide live tracking of buses using location-based services and modern web technologies. The system enables users to view the real-time location of buses on an interactive map interface, along with estimated arrival times at specific stops. The application collects location data from the driver’s mobile device (with permission) and transmits it to a centralized server using secure communication protocols. This data is then processed and displayed to users through a responsive and intuitive frontend interface. The project is developed using the MERN stack (MongoDB, Express.js, React.js, and Node.js), ensuring scalability, flexibility, and high performance. The frontend is built using React (Vite) to provide a fast and dynamic user experience, while the backend is powered by Node.js and Express to handle API requests and search functionalities real-time data processing. MongoDB is used as the database to store user data, bus details, and location history efficiently. Integration with mapping libraries such as Leaflet or Google Maps API enhances visualization by displaying routes, stops, and moving bus markers in real time. In addition to live tracking, the system includes features such as user authentication, bus route management, driver login, and estimated time of arrival (ETA) prediction. The application ensures that location sharing is performed only with user consent, maintaining privacy and security standards. Furthermore, the system is designed to handle multiple buses simultaneously, making it suitable for deployment in schools, colleges, and public transportation networks. The proposed solution significantly improves the commuting experience by reducing uncertainty and waiting time, enhancing time management, and increasing the overall efficiency of transportation systems. It also benefits transport administrators by providing better monitoring and control over fleet operations. By leveraging modern web technologies and real-time data processing, the “Where Is My Bus – Web Application” aims to bridge the gap between passengers and public transport systems, contributing to smarter and more connected urban mobility. Furthermore, the application is designed with a focus on scalability and future enhancements. Advanced features such as push notifications for bus arrival alerts, route optimization using traffic data, and integration with GPS-enabled IoT devices can be incorporated to improve accuracy and efficiency. The system can also be extended to include analytics dashboards for transport authorities, enabling them to analyze passenger demand, optimize routes, and improve service quality. By adopting a modular architecture, the application ensures easy maintenance and the ability to upgrade components without affecting overall system performance. In conclusion, the “Where Is My Bus – Web Application” serves as a practical and innovative solution to modern transportation challenges. It not only enhances passenger convenience but also promotes the use of public transport by making it more reliable and accessible. The project demonstrates the effective use of web technologies in solving real-world problems and has the potential to be implemented on a larger scale in smart city initiatives. By providing real-time insights and improving communication between passengers and transport systems, the application contributes to a more efficient, sustainable, and user-centric urban mobility ecosystem.

Keywords: Real-Time Bus Tracking, Web Application, Public Transportation System, GPS Tracking, Location-Based Services, MERN Stack, React.js, Node.js, Express.js, MongoDB, Live (ETA), Map Integration, Leaflet, Google Maps API, Smart Transportation, Fleet Management, User Authentication, IoT Integration, Urban Mobility.

Paper Id: A385

QUALITY OF WORK LIFE (QWL) OF EMPLOYEES IN THE FOOD INDUSTRY

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Abstract

Quality of Work Life is really important for companies that want to make their employees happy and productive. This study looks at how happy employee are at AR Nice Foods, a big food company in Kochi, India. The company has 200 employees. We wanted to see how happy they are what things make them happy or unhappy and how the company can make things better. We asked 50 employees some questions. Looked at some other information to get our answers. We wanted to know about things like how they like their workspace how well they get along with their coworkers if they like their job and if they feel like they can say what they think. What we found out is that most employees really like their workspace. They like the way their bosses treat them and the training they get. There are some things that the company needs to work on like helping employees get to know each other better and making it easier for them to say what they think. We learned that getting paid well having chances to learn and grow and being recognized for what they do makes employees happy and helps them do their job well. We also learned that it is really important for companies to be honest with their employees to listen to their problems and to help them balance their work and personal life. Based on what we learned we think the company should make some changes to make employees happier. They should make sure employees are treated fairly and that they can talk openly with their bosses. We think this will make employees more engaged and less likely to leave the company. In the end this study shows just how important Quality of Work Life is for companies, for companies that make food. If companies take care of their employees and make them happy they will be more productive. The company will do better. This study can help companies make a workplace where employee is happy, productive and where everyone succeeds.

Key words: Quality of Work Life (QWL), Employee Satisfaction, Job Satisfaction, Work Environment, Employee Welfare, Organizational Effectiveness

Paper Id: A386

NextGen Hiring: An AI-Driven Platform for Role-Based Career Readiness and Smart Job Matching

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Abstract

Today's job market expects students to understand not just their subject knowledge but also how well it lines up with what companies actually need. Most existing recruitment tools fall short — they match keywords and leave students guessing why they were rejected. NextGen Hiring takes a different approach. The platform extracts skills from uploaded resumes, discovers relevant job listings from both internal and live external sources, and uses a large language model to score how well a student fits a role — with clear written reasoning. Students also complete role-specific mock tests in a secure proctored environment and receive AI-generated feedback on weak areas. Testing with 50 final-year IT students showed over 93% skill extraction accuracy, a matching score error of just 4.2 points out of 100, and 86% of participants reporting that the platform helped them understand their profile gaps far better than conventional job portals.

Keywords: AI hiring platform, resume skill extraction, LLM job matching, skill gap analysis, secure mock assessment, career readiness, personalized feedback.

Paper ID : A387

DESIGN AND DEVELOPMENT OF ENVIRONMENTAL FRIENDLY SELF POWERED ELECTRIC SQUARE BALER

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ABSTRACT

The increasing demand for sustainable agricultural practices has created the need for machinery that operates without fossil fuels while maintaining high efficiency. This project presents the design and development of an environmentally friendly, self-powered electric square baler that uses solar energy, a rechargeable battery system, and an Arduino-based control architecture. The system replaces conventional diesel-powered mechanisms with a fully electric setup driven by three motor driver modules and six high-torque gear motors to perform feeding, compression, and bale ejection operations. A solar panel integrated with a charge controller continuously charges the battery, enabling off-grid operation in remote agricultural fields. The control system incorporates a moving trigger and a control trigger for automated sequencing, along with limit switches for safe and precise mechanical movement. Motor speed and direction are regulated through programmable logic to achieve consistent bale size and optimal compaction. The proposed baler reduces carbon emissions, minimizes operating costs, and offers a compact, low-maintenance suitable for small and medium-scale farmers. Experimental evaluation demonstrates stable motor performance, effective solar charging, and improved energy efficiency. This self-powered electric square baler thus provides a sustainable, cost-effective alternative to traditional fuel-based baling equipment.

Keywords: Sustainable Agricultural Practices, Self-Powered, Solar Energy, Arduino Architecture, Off-Grid Operations, Small and Medium-scale , Cost-Effective.

Paper ID - A388

Impact of Sleep Quality on Cognitive Performance among Young Adults

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Abstract

Sleep is a vital biological process that significantly influences cognitive functioning, including attention, memory, and executive processes. The present study examined the relationship between sleep quality and cognitive functioning among young adults in the Malwa region of Madhya Pradesh, India. A cross-sectional design was employed with a sample of 674 participants aged 18-26 years ($M = 19.86$, $SD = 1.90$), comprising 67.1% females and 32.9% males. Sleep quality and cognitive functioning were assessed using a structured self-reported questionnaire, including items adapted from the Cognitive Failures Questionnaire. Descriptive statistics revealed a mean sleep quality score of 22.31 ($SD = 3.49$), cognitive orientation 3.79 ($SD = 1.14$), and cognitive mistakes 37.79 ($SD = 9.39$). Spearman's correlation analysis indicated that sleep quality was not significantly associated with cognitive orientation ($r_s = -0.019$, $p = .626$), but showed a significant positive correlation with cognitive mistakes ($r_s = 0.240$, $p < .001$). The findings suggest that poorer sleep quality is associated with increased cognitive errors in daily functioning. These results highlight the importance of sleep quality as a key psychosocial factor influencing cognitive efficiency among young adults.

Keywords: sleep quality, cognitive functioning, cognitive mistakes, psychosocial factors, young adults.

Paper Id: A389

Smart Water Management System in IOT

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Abstract

A water quality monitoring system can aid in preserving the environment, ensuring the security of nearby water sources, and fostering economic growth in rural areas. As a result, this will help to develop a system here that employs Internet of Things and Machine Learning to monitor the quality of water. This paper discusses the characteristics of water to let us know whether it is fit for human consumption or not. The sensors dipped in water samples acquired from wells, lakes, rivers, ponds, or other places are used to inform the development of an effective model made up of TDS, pH and turbidity sensors. The data will be delivered from the sensors as soon as they are received to the IDE, where it will then be sent to the cloud server. The model effectively accounts for test tables, where 1 indicates the water is fit for drinking and 0 indicates the water is not. The values were classified differently using Machine Learning models like SVM, RF and XG Boost method. Training data is pre-processed before being fetched from the cloud. Over that data, machine learning models like Support Vector Machine, Random Forest & Extreme Gradient Boost has been implemented. The maximum accuracy of 95.12% was observed using XG Boost.

Keywords: Internet of Things (IoT), Water Level Monitoring, Water Flow Sensor Leakage Detection, Water Conservation, Real-Time Monitoring, Cloud-Based Data Management, Automated Pump Control, Sustainable Water Management.

Paper Id:A390

SMART FOOD WASTE REDUCTION AND DONATION MANAGEMENT SYSTEM

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ABSTRACT

Food waste is a major issue worldwide. Over 820 million people go hungry each year, yet one-third of all food produced is wasted. The primary cause of this is the lack of an appropriate system to link those with excess food to those in need. A Python Flask-based online application called FoodShare Network addresses this issue by instantly connecting food contributors, such as hotels and restaurants, with non-governmental organizations. The system uses machine learning to estimate food surplus, automatically classifies food urgency based on expiration dates, notifies donors and non-governmental organizations via email, displays donation locations on a real-time map, and offers an AI chatbot to assist users. Additionally, the platform offers login accounts with a comprehensive dashboard for tracking all activity for contributors, NGOs, and administrators.

Keywords: OpenStreetMap, AI chatbot, Flask web application, real-time donation tracking, NGO coordination, email notification, linear regression, and food waste management.

PAPER ID : A391

Attention Based Explainable Deep Learning Framework for Fetal Ultrasound Image Plane Classification

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Abstract

Fetal ultrasound imaging is a crucial tool in prenatal care for monitoring fetal growth and detecting abnormalities. However, accurate classification of fetal ultrasound image planes is challenging due to low image quality, noise, and high similarity between anatomical structures. Traditional manual analysis is time-consuming and highly dependent on operator expertise, while existing deep learning models often lack interpretability, limiting their clinical adoption. This study proposes an Attention-Based Explainable Deep Learning Framework for fetal ultrasound image plane classification. The framework utilizes a convolutional neural network (CNN) enhanced with an attention mechanism to automatically focus on the most relevant regions of the ultrasound images, improving classification accuracy. The model is trained on labeled fetal ultrasound datasets containing multiple standard planes such as brain, abdomen, femur, thorax, and maternal cervix. To address the issue of model transparency, explainability techniques such as Grad-CAM (Gradient-weighted Class Activation Mapping) are integrated to generate visual heatmaps, highlighting important regions that influence the model's predictions. This enhances clinical trust by providing interpretable results alongside predictions. Experimental results demonstrate that the proposed model achieves higher accuracy and better generalization compared to conventional methods, while also offering meaningful visual explanations. The framework has the potential to assist clinicians in faster and more reliable diagnosis, reducing human error and improving prenatal healthcare outcomes.

Keywords: Fetal Ultrasound Imaging , Image Plane Classification , Deep Learning , Convolutional Neural Network (CNN) , Attention Mechanism , Explainable Artificial Intelligence (XAI) , Grad-CAM , Medical Image Analysis

PAPER ID:A392

**A study on the gap between quality management practices
and their actual implementation in the spring
manufacturing industry**

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ABSTRACT

This study focuses on how quality management practices are actually carried out in the spring manufacturing industry, with special reference to Venkateswara Steels and Springs India Pvt. Ltd. The main aim is to understand the gap between planned quality procedures and their real execution at the operational level. Data for the study were collected from 150 employees working in different departments through a structured questionnaire. The research looks into important factors such as employees' awareness of quality practices, the level of support provided by management, availability of training programs, and adherence to quality standards. The results show that lack of proper training, weak communication, and pressure to achieve production targets affect the effective implementation of quality practices. The study suggests that improving employee training, encouraging better communication, and increasing management involvement can help in reducing the gap. This will support the organization in improving product quality and overall performance.

Keywords: Quality Management, Implementation Gap, Manufacturing Industry, Spring Manufacturing, Quality Control

Paper Id: A393

Brand Loyalty vs Platform Loyalty in Quick Commerce: A Consumer Behaviour Analysis

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Abstract

The growth of e-commerce platforms have changed consumer behaviour on how people purchase items. Companies such as Blinkit, Zepto and Swiggy Instamart provide consumers with immediate delivery of products to their customers and provides consumers with the ability to purchase products that will be delivered to their location within minutes. This new approach to shopping is dramatically changing the way that consumers make purchasing decisions. To remain competitive and to maintain a competitive edge within the market, it is necessary to have a thorough understanding of what influences consumer loyalty to brands and platforms, as well as to what degree are customers loyal to a particular brand or platform when making a purchasing decision. The purpose of this study was to determine the various elements that shape consumer's attitudes and influence their buying choices. All data were collected from a total of 111 respondents who utilize any or all of the platforms of current interest. Data were collected via a google form and the responses were rated on a scale of one to seven from strongly disagree to strongly agree by respondents using a random non-representative sample. Respondents were chosen based upon individual respondent convenience. Data collected were analysed utilizing spss statistical software, the results indicated that respondents are moderately loyal to connected brands but the features of a connected platform such as delivery capability, product selection/availability, user-friendly website interface (easy to use), and flexible payment options are much more influential on their purchase decisions. The results demonstrated that if a brand they desire to purchase is not available on the platform they will search other connected platforms for the same item to purchase that brand or a comparable item; this indicates that platforms are only loyal to consumers branch to which they can find connected platforms or brands to purchase via the platform. The results from this study provide solid recommendations for the connected platform to maximize and maintain loyal customers and for the entire connected platform to be successful in their business operations.

Keywords: Quick Commerce, Brand Loyalty, Platform Loyalty, Consumer Behaviour, Digital Retail

Paper Id: A394

Advances in Low-Power CMOS VLSI: Circuit-Level Optimization and Data-Driven Power Modeling

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Abstract

Power consumption has emerged as a critical design constraint in modern CMOS very-large-scale integration (VLSI) systems due to increasing circuit complexity, higher operating frequencies, and the demand for energy-efficient computing across digital, wireless, and intelligent applications. Sequential elements such as flip-flops contribute significantly to total power dissipation, while accurate power estimation at early design stages remains challenging due to process variations and reduced design turnaround times. Recent research has addressed these challenges through circuit-level innovations, including dual-edge triggered and implicitly clocked flip-flops, architectural optimization for high-frequency and artificial intelligence hardware, and advanced device modeling for extreme operating conditions. In parallel, machine learning-based power estimation techniques have gained prominence as efficient alternatives to traditional simulation-driven approaches. This literature review presents a comprehensive analysis of recent advancements in low-power CMOS VLSI design, encompassing energy-efficient flip-flop architectures, power-aware system-level techniques, cryogenic CMOS modeling, and intelligent power estimation using machine learning algorithms such as SVM, Random Forest, and hybrid deep learning models. The reviewed works demonstrate significant improvements in power efficiency, delay reduction, estimation accuracy, and computational efficiency. The survey highlights emerging trends, identifies existing research gaps, and underscores the growing convergence of circuit design and data-driven methodologies for achieving reliable and energy-efficient CMOS VLSI systems suitable for next-generation applications.

Keywords: Low-Power CMOS VLSI, Energy-Efficient Flip-Flop Design, Dual-Edge Triggering, Machine Learning-Based Power Estimation

Paper Id: A395

Smartphone Dependency and Coping Strategies: A Correlation Study

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Abstract.

In today's digital age, smartphones have become an inseparable part of everyday life, especially for young adults. From staying connected with friends and family to attending classes, working, and seeking entertainment, smartphones play a central role in daily routines. While these devices offer convenience and constant connectivity, their excessive use has increasingly become a matter of concern. Smartphone dependency can be defined using DSM criteria, where an individual a) Is preoccupied with the smartphone, b) Needs to use the smartphone with increased amounts of time in order to achieve satisfaction, c) Has made unsuccessful efforts to control, cut back, or stop smartphone use, d) Is restless, moody, depressed, or irritable when attempting to cut down or stop smartphone use. For many of us, we don't even realise when simple phone use slowly turns into addiction. Often, we turn to our phones not out of boredom, but to cope. Coping is the ability to mobilise cognitive, emotional and behavioural methods to deal with problems and manage the internal and external demands of stressful situations (Hamby et al., 2015). The present study aimed to discern the correlation between Smartphone dependency and coping strategies among young adults. Data were collected from 120 participants belonging to the age group of 18-25 years from the Delhi NCR region using purposive sampling. Measures included the Mobile Phone Problem Use Scale-10 (MPPUS10) (Foerster et al., 2015), which is a shorter version of the original MPPUS-27 (Bianchi and Phillips, 2005) and the Coping Scale (Hamby et al., 2013). Data was analysed using descriptive statistics, and Pearson's correlation coefficient was computed using Jamovi version 2.6. Results indicated a statistically significant positive correlation between smartphone dependency and coping strategies ($r = .22, p = .016$). The relationship between smartphone dependency and both emotion-focused and problem-focused coping was also examined. Future research may include more diverse samples and investigate additional psychological variables, such as stress and anxiety, to better understand their role in shaping coping strategies. Further studies may also explore coping mechanisms such as emotion regulation, social support seeking, and distraction as ways individuals manage stress and psychological challenges.

Keywords: smartphone dependency, coping strategies, young adults, problem-focused, emotion-focused.

Paper Id: A396

Secure IAC framework using Terraform

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Abstract

Infrastructure-as-Code (IaC) tools such as Terraform are widely used for automating cloud infrastructure deployment. However, security misconfigurations in IaC scripts may lead to severe vulnerabilities, including data exposure and unauthorized access. Manual inspection of Terraform configurations is time-consuming and error-prone. This paper proposes an automated secure Infrastructure-as-Code platform that scans Terraform scripts, detects security misconfigurations, provides remediation suggestions, and enables secure deployment on Amazon Web Services (AWS). The system integrates static security analysis, policy validation, and automated deployment workflows. Experimental evaluation demonstrates improved detection of vulnerabilities and reduced manual effort, making the proposed system suitable for DevSecOps environments.

Keywords —Infrastructure as Code, Terraform, AWS, Cloud Security, DevSecOps

Paper Id: A397

STABILIZATION OF EXPASIVE SOIL USING TERRAZYME AND SUGARCANE ASH''

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Abstract

Expansive soils cause serious problems in civil engineering works due to their high swelling and shrinkage behavior, which leads to cracks and structural damage. Soil stabilization is an effective method to improve the engineering properties of such soils. This study investigates the stabilization of expansive soil using TerraZyme, a bio-enzyme, and Sugarcane Bagasse Ash (SCBA) as stabilizing agents. TerraZyme improves soil strength by reducing water absorption and enhancing particle bonding, while SCBA acts as a pozzolanic material that increases strength and reduces plasticity. Laboratory tests such as Atterberg limits, compaction, and California Bearing Ratio (CBR) were conducted on untreated and treated soil samples. The results indicate a significant reduction in plasticity index and swelling potential, along with improved strength characteristics. The combined use of TerraZyme and sugarcane ash provides an economical, eco-friendly, and sustainable solution for stabilizing expansive soils, making them suitable for pavement and foundation applications.

Paper Id: A398

MEDIMATCH – DRUG AVAILABILITY RECOMMENDER

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Abstract

Access to medicines in rural and semi-urban areas remains a significant challenge due to the lack of digitized pharmacy systems and real-time inventory tracking. Patients often spend considerable time visiting multiple pharmacies to check the availability of required medicines, leading to delays in treatment and reduced accessibility. To address this issue, the proposed system, MEDIMATCH, presents a centralized digital platform. The system enables real-time medicine search, suggestion for non-prescribed medicines allowing users to check availability across multiple pharmacies and reserve medicines online prior to visiting. It supports pharmacy inventory management with dynamic stock updates, along with low stock alerts and expiry date monitoring to ensure effective inventory control. An admin approval mechanism is incorporated to authenticate and manage pharmacy. Additionally, the system provides multilingual support in to enhance usability among diverse users. Users can collect reserved medicines within a specified deadline set by pharmacies. The platform also generates alerts for highly demanded medicines and integrates an intelligent composition-based recommendation engine to suggest suitable alternative medicines when required. The system is developed using Flutter as the frontend, Node.js and Express.js as the backend, and MongoDB as the database.

Keywords: Drug Reservation, Recommendation, Pharmacy Inventory, Multilingual

Paper ID: A399

SMART SKILL GAP MAPPING SYSTEM FOR STUDENTS

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ABSTRACT

In today's competitive job market, many students face difficulties in meeting industry expectations due to a lack of clarity about required skills. This gap between academic learning and industry needs often affects students' confidence and employability. To address this issue, this paper presents a Smart Skill Gap Mapping System for Students, designed to help learners understand where they stand and what they need to improve. The system gathers information about a student's current skills, academic background, and career interests, and compares it with the skills expected in the industry. Based on this comparison, it provides simple and personalized suggestions, such as which skills to learn, possible career paths, and relevant learning resources. The goal is to guide students step-by-step rather than overwhelm them with information. The proposed system is built using modern web technologies and focuses on ease of use, making it accessible to students from different backgrounds. It also allows students to track their progress over time, helping them stay motivated and focused on their goals. Overall, this system aims to support students in improving their skills in a structured way and becoming better prepared for real-world job opportunities. It can also help educational institutions understand current industry needs and support students more effectively.

Keywords: Skill Gap, Employability, Student Skills, Industry Requirements, Career Readiness.

Paper Id: A400

**EXPERIMENTAL INVESTIGATION AND
OPTIMIZATION OF PROCESS PARAMETER OF
HIGH SPEED HARD TURNING PROCESS ON EN8
STEEL**

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Abstract

The main objective of today's manufacturing industries is to produce low-cost, high-quality products in a short time. The selection of optimal cutting parameters is a very important issue for every machining process in order to enhance the quality of machining products and reduce the machining costs. To allow for high productivity, high flexibility and avoidance of coolants, hard turning is nowadays an alternative to grinding in the finishing of workpieces in hardened steels. This paper investigates the machining of EN 8 to find optimal parameters for the CNC Hard turning process. Taguchi's L9 Orthogonal array is used to formulate the experimental layout, to analyze the effect of each parameter on the machining characteristics and to predict the optimal choice for each turning parameters such as Speed, Feed and Depth of cut. The Minimum surface finish was achieved when depth of cut of 0.2 mm, Spindle speed of 1250 RPM and feed 0.05 mm. Apart from surface finish characteristics, the remaining machining and geometrical attributes that are most significantly affected by feed characteristics during hard turning operations are noteworthy.

Keywords:Material Removal Rate(MRR) ,Surface roughness(RA), Hard Turning, EN8 Steel, Surface finish, Cylindricity Error

Paper Id: A401

Modelling Rabies Transmission via a Nonlinear SEIR–SEIV Approach with Region-Specific Parameterization and Stability Analysis

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Abstract:

In endemic areas, rabies transmission within domestic dog populations remains a major public health concern. This study develops a nonlinear compartmental SEIR-SEIV framework that couples human and canine dynamics while incorporating zoonotic transmission and region-specific epidemiological parameters. The basic reproduction number R_0 is derived using the next-generation matrix approach, and equilibrium states are analyzed for stability. Sensitivity analysis identifies low vaccination coverage and the recruitment of susceptible dogs as key drivers of transmission. Numerical simulations across representative regional scenarios demonstrate that heterogeneity in transmission and vaccination parameters significantly affects the magnitude and persistence of outbreaks. The results indicate that reducing the influx of susceptible dogs and increasing canine vaccination coverage can drive R_0 below unity, enabling effective disease control. This model provides a quantitative basis for designing region-specific rabies intervention strategies.

Keywords: Rabies modelling-SEIR-SEIV- Nonlinear dynamics- Reproduction number- Stability analysis.

Paper Id: A402

Explainable Multilingual Civic Complaint Resolution System

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Abstract

Civic complaint management plays a crucial role in smart urban governance, yet many existing platforms fall short in multilingual support and explainability. This paper presents an Explainable Multilingual Civic Complaint Resolution System that processes complaints in English, Hindi, and Hinglish and routes them to three key municipal departments: Sanitation, Water Supply, and Transportation. The architecture uses MuRIL-based embeddings for multilingual category classification and employs XGBoost to predict urgency. To enhance transparency, SHAP explanations are provided for both category and urgency decisions, offering human-interpretable outputs for citizens and officials. A balanced dataset of 15,177 instances, derived from real-world complaints translated using MarianMT and indic-transliteration, demonstrates robust performance and interpretable results, highlighting the promise of explainable multilingual complaint resolution in civic applications.

Keywords: Multilingual NLP, Civic Complaints, Explainable AI, MuRIL, XGBoost, SHAP, Smart Governance, Complaint Routing.

Paper ID: A403

R GUARD - RANSOMWARE DEFENSE SYSTEM USING HEURISTIC TRAPS AND BEHAVIOURAL ANOMALY DETECTION

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ABSTRACT

Ransomware is a highly destructive malware that encrypts systems, demanding a payment for decryption. It is a constantly evolving threat, making standard defence mechanisms ineffective. This abstract outlines a novel ransomware detection system that integrates machine learning models with deception based detection for behavioural pattern analysis and decoy file mechanisms within a distributed server-agent framework. The main aim is to overcome the limitations of traditional signature-based detection systems by proactively identifying both known and zero-day ransomware threats through dynamic analysis of system processes and deceptive techniques. The proposed system employs Long Short-Term Memory networks with a sliding window approach for feature extraction and a combination of Uncertainty-Aware Dynamic Early Stopping with Deep Belief Networks for robust pattern detection in behavioural analysis and preventing overfitting. For decoy file mechanisms, Random Forest classifiers, augmented by R-Trap framework, is used for feature extraction, while DBSCAN (Density-Based Spatial Clustering of Applications with Noise) is used for strategized decoy file placement to maximize deception and detection efficacy. This integration of models aims to achieve lower false positive rates while maximizing the early detection of ransomware, particularly against evasive and polymorphic strains by dynamic obfuscation signature analysis and adaptive learning designed to continually evolve with the ransomware variants. The system leverages a server-agent architecture, where lightweight agents deployed on individual nodes monitor activity and frequently transfer data to a central server for intensive deep learning analysis. This centralized processing enables the deployment of complex models that would be computationally heavy on endpoint agents, thereby enhancing detection capabilities.

Keywords: Ransomware Detection, Machine Learning, Cyber Security, Behavioural Analysis, Deception Based Detection

Paper Id: A404

**Drivers of Engagement Among Early-Career Employees
(18–27)**

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Abstract

The employee engagement has been shown to be a fundamental factor that determines the performance of the organization, the retention of the employees and the overall productivity of the workplace. This paper seeks to recognize and assess the major indicators of engagement among early-career employees within the age group of 18-27. Since this population of workers is a large and rising portion of the workforce, it is important to understand what drives their participation rates in organizational activities to recruit, inspire and retain young talent. The research has made a specific emphasis on the investigation of the effect of different workplace factors in employee engagement and the identification of the most important of them. The quantitative research methodology was developed based on a structured questionnaire that was administered to employees of various professions in their early careers. The survey was divided into various sections to measure some of the key variables in terms of career growth and learning, Manager support, Compensation and recognition, work environment and culture and work life balance. One hundred and valid responses were gathered and examined. Regression analysis was used to analyse the data with the help of a five-point Likert scale and the coefficients of each independent variable in relation to employee engagement. The results of the research indicate that the most significant driver of employee engagement is compensation and recognition ($\beta = 0.322$, $p < 0.01$) which means that decent payment and the appreciation of the employee work are the greatest contributor to the level of employee engagement. The second most significant factor was considered work-life balance ($\beta = 0.283$, $p < 0.05$), as it is important to note that flexibility and employee well-being play a crucial role in ensuring engagement. Conversely, other factors including career development, manager support as well as organizational culture were not found to be statistically significant when they were combined. Finally, the paper has proven that though a variety of workplace variables can be related to employee engagement, the two that are the most crucial among the early-career employees are compensation and work-life balance. Competitive compensation systems and flexible working practices should therefore come as a priority in organisations to enhance the engagement and retention of young talent.

Paper Id: A405

IMPACT OF SOCIAL MEDIA POSITIONING ON BRAND PREFERENCE AMONG GEN – Z CONSUMERS

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Abstract

This study examines the impact of social media positioning on brand preference among Generation Z consumers in the digital era. With the rapid growth of platforms such as Instagram, TikTok, and YouTube, brands increasingly rely on social media strategies to shape consumer perceptions and influence purchasing behaviour. Generation Z, being highly digitally engaged and socially conscious, represents a critical segment whose brand preferences are strongly influenced by online interactions. The research focuses on five key dimensions of social media positioning: brand authenticity, influencer collaborations, visual branding and content aesthetics, value-driven messaging, and interactive engagement. A descriptive research design with a quantitative approach was adopted, and primary data were collected through a structured questionnaire using a 5-point Likert scale. The study sampled 216 Gen-Z respondents using convenience sampling. Statistical tools such as descriptive analysis, correlation, regression, and reliability analysis (Cronbach's Alpha = 0.86+) were used to analyse the data. The findings reveal that all five dimensions significantly influence brand preference among Gen-Z consumers. Brand authenticity and influencer collaborations show a strong positive relationship with brand preference, while visual aesthetics enhance attention and recall. Value-driven messaging strengthens trust and alignment with consumer beliefs, and interactive engagement fosters deeper emotional connection and loyalty. The study highlights that an integrated social media positioning strategy is essential for building sustainable brand preference among Gen-Z. The research contributes to the growing body of knowledge in digital marketing and provides practical insights for marketers to design effective, value-oriented, and engaging social media strategies. It also emphasizes the importance of authenticity and meaningful communication in establishing long-term brand relationships with the Gen-Z segment.

Keywords: Social Media Positioning, Brand Preference, Generation Z, Influencer Marketing, Brand Authenticity, Digital Marketing

Paper Id: A406

A Study on Working Capital Management and Profitability in the FMCG Sector

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Abstract

Working capital management plays a crucial role in determining the financial efficiency and profitability of companies, especially in the Fast Moving Consumer Goods (FMCG) sector where operations involve high inventory turnover and continuous cash flows. The present study examines the relationship between working capital management and profitability with reference to ITC Limited and Hindustan Unilever Limited. The research focuses on analyzing liquidity ratios, efficiency ratios, and profitability ratios for the period from 2021–22 to 2023–24. The study adopts a descriptive research design and uses secondary data collected from annual reports and financial statements of the selected companies. Financial ratio analysis is used as the primary tool for data analysis. The findings reveal that effective management of working capital components such as inventory, receivables, and payables significantly influences profitability and operational efficiency. The study highlights that while ITC maintains stronger liquidity, HUL demonstrates greater efficiency in working capital utilization.

Keywords: Working Capital Management, Profitability, FMCG Sector, Liquidity Ratios, Efficiency Ratios, Financial Performance

Paper Id: A407

DESIGN OF EXOSUIT - A ROBOTIC ARM

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Abstract

Exosuits are wearable robotic systems designed to enhance human movement by supporting strength, endurance, and joint function. They reduce physical strain during demanding tasks and improve efficiency by assisting natural human motion. By integrating sensors, exosuits can monitor user activity and surrounding conditions, enabling timely feedback and improved operational safety. Recent advancements in lightweight materials, soft robotics, sensor integration, and energy-efficient actuation have significantly improved the performance and practicality of exosuit systems. These technologies enable applications such as walking assistance, load handling, and repetitive arm movements for both able-bodied users and individuals with physical limitations. Emphasis on ergonomic design and adaptive human– machine interaction ensures comfort, usability, and accessibility. Exosuits represent a growing field in human augmentation technology, bridging the gap between conventional assistive devices and advanced wearable robotic systems

Keywords: Exosuit, endurance, ergonomic, human argumentation technology

Paper Id: A408

Design analysis and fabrication of semi automatic agriculture seed sowing robot

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Abstract

The presented model illustrates the design, analysis and fabrication of a semi-automatic agriculture seed sowing robot aimed at improving efficiency and reducing manual labor in farming operations. The system consists of a compact, four-wheeled mobile platform powered by a rechargeable battery and driven by DC motors. A microcontroller-based control unit is integrated with electronic components to manage movement and seed dispensing operations effectively. The robot is equipped with a seed storage container and a controlled outlet mechanism connected through a pipe, enabling regulated seed flow into the soil. The structure includes a sturdy chassis, motor driver circuits and wiring arranged systematically to ensure stable operation in field conditions. A front-mounted extension suggests provision for soil interaction or directional control, while onboard circuitry supports semi-automatic functioning based on user input. The analysis focuses on optimizing motor torque, power consumption, and seed dispensing rate to achieve uniform seed placement. The mechanical design ensures balance and mobility across uneven surfaces, while the electronic system enhances control accuracy and reliability. Fabrication involves assembling readily available components, making the system cost-effective and accessible for small-scale agricultural applications.

Keywords: Semi automatic multipurpose easy to handle low cost effect

Paper Id: A409

CAPACITY BUILDING FOR SUSTAINABLE LIVELIHOODS

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Abstract

Ensuring consistent and essential livelihood opportunities remains a major challenge, particularly for socially and financially vulnerable communities. In such an unstable context, capacity enhancement is a useful approach, as it supports individuals in strengthening their abilities, improving practical understanding, and engaging in productive, income-generating activities. Through continuous learning processes and proper guidance, participants can increase their earning potential and improve their overall standard of living. This study seeks to understand how development-oriented initiatives contribute to improving livelihood conditions and encouraging financial independence. It evaluates the influence of training programmes, competency improvement efforts, and organizational support on improved livelihood outcomes. The research adopts a descriptive approach and is based on original data collected from selected respondents through structured questionnaires and field engagement. The results demonstrate that participation in development programmes leads to better income prospects, improved living conditions, and increased self-confidence among individuals. It is also evident that continuous competency development and support mechanisms play a crucial role in enhancing financial security and minimizing economic risks. The study emphasizes that sustained development efforts are essential for achieving long-term livelihood progress and inclusive socio-economic advancement.

Keywords: Capacity Building Initiatives, Livelihood Improvement, Skill Enhancement Programmes, Economic Empowerment, Income Generation, Community Development.

Paper Id: A410

Interpretable AI Framework for Credit Risk Assessment in Financial Institutions

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Abstract

We're building a user-friendly credit risk model, with a focus on accuracy, usability, and interpretability; we present a machine learning-based credit risk prediction system that classifies loan applicants as creditworthy or non-creditworthy. The proposed framework evaluates multiple classification models, using XGBoost as the primary predictive model due to its strong performance on structured financial data and Logistic Regression as a baseline. XGBoost improves prediction accuracy, through its black -box nature limits decision-making transparency. Explainable Artificial Intelligence (XAI) techniques are integrated into the system to overcome over this limitation. SHAP and LIME are used for global and local explanations helping understand model behaviour and individual predictions. These explanations pinpoint key features influencing credit risk decisions and promote stronger rationale for approvals or rejections. The system highlights both explanatory accuracy as well as power are essential for an effective credit risk assessment. The approach proposed enhances transparency, trust, and regulatory compliance by combining interpretability techniques with high-performing models. The results demonstrate that the system is suitable for real credit assessment and financial decision- support applications.

Keywords: Credit Risk Prediction, Explainable Artificial Intelligence (XAI), Logistic Regression, Machine Learning, SHAP, Model Interpretability, Financial Risk Analysis

Paper Id: A411

Neuromarketing: Understanding Customer Psychology

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Abstract

Neuromarketing is an emerging interdisciplinary field that combines principles of neuroscience, psychology, and marketing to understand consumer behavior at a deeper level. Traditional marketing methods often rely on surveys and self-reported data, which may not always accurately reflect consumers' true preferences. Neuromarketing, however, uses advanced techniques such as brain imaging, eye tracking, and biometric measurements to analyze how consumers subconsciously respond to marketing stimuli. This study explores how neuromarketing helps businesses understand customer psychology by identifying emotional and cognitive reactions during decision-making processes. It highlights the role of emotions, attention, memory, and perception in influencing purchasing behavior. The paper also examines how companies use neuromarketing strategies to design effective advertisements, product packaging, and branding that appeal directly to the human brain. Furthermore, the research discusses the ethical considerations associated with neuromarketing, including concerns about consumer manipulation and data privacy. While neuromarketing offers significant advantages in predicting consumer behavior and improving marketing effectiveness, it also raises important questions about transparency and ethical boundaries. In conclusion, neuromarketing provides valuable insights into the hidden drivers of consumer decisions, enabling organizations to create more impactful and customer-centric marketing strategies. As technology continues to evolve, neuromarketing is expected to play a crucial role in shaping the future of marketing practices.

Keywords: Neuromarketing, Consumer Behavior, Customer Psychology, Emotional Response, Marketing Strategy, Cognitive Processes, Advertising Effectiveness, Ethical Issues.

Paper Id: A412

CodeForge: An Intelligent Programming Learning and Automated Code Evaluation Platform

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Abstract

CodeForge is a collaborative coding platform designed to help students and developers improve their programming skills through practice, teamwork, and project-based learning. In today's technology-driven world, learning programming is essential, but many learners struggle to find a platform where they can practice coding, share ideas, and work together on projects. CodeForge aims to solve this problem by providing an interactive environment where users can write, test, and manage code efficiently. The platform supports multiple programming languages and provides tools such as code editing, compilation, debugging, and project management. These features allow users to experiment with different programming concepts and improve their problem-solving abilities. CodeForge also encourages collaboration by allowing users to work together on coding projects, review each other's code, and give feedback, which helps in learning new approaches and improving coding quality. In addition, CodeForge offers coding challenges and practice exercises for users at different skill levels. Beginners can build their basic programming knowledge, while advanced users can enhance their skills through complex problems. The system is designed with a user-friendly interface and secure architecture to ensure easy access and safe code execution. Overall, CodeForge helps learners gain practical coding experience, develop teamwork skills, and build confidence in software development.

Paper Id : A413

Remote Sensing and GIS Applications in Climatological Disaster Management: A Concise Review

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Abstract

Climatological catastrophes such as droughts, glacial lake outburst floods (GLOFs), snow/glacier melt runoff, and forest fires are becoming more dangerous under the conditions of a changing climate. In this review, Remote Sensing (RS) and Geographic Information Systems (GIS) applications in mapping risk zones, modelling hazards, and designing early warning systems are discussed. We synthesise the results of the literature analysis of 2016-2025 on hazard types. RS offers essential information in the form of satellite images (Landsat, Sentinel, MODIS) to monitor droughts based on vegetation indices, glacial lakes delineation, snow cover, and fire detection. GIS combines these data with topography and meteorological parameters to be used in spatial analysis, zoning of hazards and hydrodynamic modelling. Machine learning improves the predictive abilities of fire risk and flood simulation. Real-time monitoring is made possible by cloud-based platforms. The main issues are the limitation of the resolution, the cloud cover, and the model validation. Combined RS-GIS solutions offer the necessary decision-support systems for disaster preparedness and mitigation.

Keywords: Remote Sensing, GIS, Drought, GLOF, Forest Fires, Hazard Mapping, Early Warning

Paper Id : A414

A Comprehensive Review of Data Imputation Techniques: Challenges and Advances in Financial Time Series Data

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Abstract

Missing values in datasets are inevitable due to various reasons, whether they are intentional or unintentional. However, these missing values significantly influence the decision-making and the reliability of the results. Hence, handling the missing values in large-scale datasets is a challenging task, and it becomes even more critical when dealing with the time series data since the past and future values are interdependent. Proper handling of the missing data is essential in the financial time series data for applications such as financial forecasting, fraud detection, algorithmic trading, and credit score analysis. Various approaches, ranging from traditional statistical methods to deep learning models, have been developed to fill in the missing data (data imputation). This paper presents a comprehensive review of existing data imputation techniques for financial time series data. The methods are analyzed and categorized based on their underlying assumptions, strengths, and limitations, with the goal of assisting researchers and practitioners in selecting appropriate imputation strategies for different financial scenarios.

Keywords: data Imputation, missing data, Handling Missing data, Financial data, Time series data, Machine Learning

Paper Id : A415

Employee Well-being in the Digital Workplace: A Theoretical Framework Linking HR Practices, Work Engagement, and Organizational Sustainability

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Abstract

The rapid expansion of digital technologies and remote work environments has significantly transformed the nature of work and employee experiences. While digitalization offers flexibility and efficiency, it also introduces challenges related to employee well-being, work-life balance, and psychological stress. Human Resource Management (HRM) plays a critical role in addressing these challenges by implementing practices that support employee well-being and organizational sustainability. This theoretical paper examines the relationship between HR practices, employee well-being, work engagement, and organizational sustainability in the context of digital workplaces. Drawing upon job demands–resources theory, social exchange theory, and human capital theory, the study develops a conceptual framework explaining how HR practices influence employee well-being and engagement, which in turn affect organizational outcomes. The paper argues that supportive HR practices, such as flexible work policies, digital wellness programs, and continuous learning opportunities, enhance employee well-being and foster higher levels of engagement. In turn, engaged employees contribute to improved organizational sustainability and performance. The study also highlights the mediating role of work engagement in the relationship between well-being and organizational outcomes. The proposed framework provides a theoretical foundation for understanding the importance of employee well-being in digital work environments. Future research is encouraged to empirically test the model using advanced statistical techniques such as structural equation modeling.

Keywords: Employee Well-being, Digital Workplace, HR Practices, Work Engagement, Organizational Sustainability.

Paper Id : A416

Detect and Prevent Unauthorized Use of Electric Fences

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Abstract

The Unauthorized Use Detection and Prevention System for Electric Fences is an Arduino-based security solution developed to enhance the safety and reliability of electric fence installations. The system continuously monitors critical electrical parameters such as voltage and current using dedicated sensors to detect abnormal operating conditions or misuse. Two IR sensors are employed to identify unauthorized tampering or intrusion near the fence area. An I2C LCD provides real-time display of sensor readings and system status for local monitoring. When abnormal electrical behavior or unauthorized access is detected, the system activates a buzzer for immediate alert, disconnects the fence power through a relay controlled via a m-inverter, and sends instant warning messages to the authorized user using a GSM module. Powered by a regulated 12 V supply, the proposed system offers an effective, low-cost, and reliable solution to prevent unauthorized usage and ensure safe operation of electric fencing systems.

Keywords: Arduino, Security, Monitoring, GSM, Sensors

Paper Id: A417

SYNTHESIS OF MXene USING IN SITU HYDROFLUORIC ACID METHOD

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ABSTRACT

MXenes are a new class of two-dimensional materials derived from MAX phase compounds and are gaining attention because of their excellent electrical conductivity, large surface area, and hydrophilic nature. In this work, MXene is synthesized from the MAX phase Ti_3AlC_2 using the in situ hydrofluoric acid etching method. In this method, hydrofluoric acid is generated in situ by the reaction between lithium fluoride (LiF) and hydrochloric acid (HCl), which selectively removes the aluminum (Al) layer from the MAX phase structure. This process results in the formation of layered $Ti_3C_2T_x$ MXene sheets. After the etching process, the material is repeatedly washed and centrifuged to remove residual acids and salts. The obtained MXene shows a characteristic layered or accordion-like structure. The synthesized material is further confirmed through characterization techniques. MXenes are unique due to their high electrical conductivity, flexible surface chemistry, and excellent mechanical stability. This study demonstrates a simple and effective method for synthesizing MXene using the in situ HF method and highlights its potential for advanced technological applications such as biogas, energy storage devices, water purification, sensors, electromagnetic interference shielding, catalysis and biomedical applications such as drug delivery and cancer therapy.

Keywords: MXene, Two-dimensional materials, In situ HF method, $Ti_3C_2T_x$, Characterization.

Paper Id: A418

IoT-Based Smart Energy Management System

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ABSTRACT

With the global surge in energy consumption driven by population growth and technological advancements, efficient energy management at the consumer level has become a critical priority. Smart meters (SMs), when integrated with smart energy management systems (SEMS), have proven indispensable for real-time energy monitoring, accurate billing, and remote control. This project proposes an Internet of Things (IoT)-based SEMS designed to optimize energy utilization through seamless communication and automation. The system incorporates advanced techniques such as demand-side management (DSM) and non-intrusive load monitoring to enhance resource allocation and energy efficiency. To address electricity theft, especially in regions where it is prevalent, the proposed solution integrates sensors capable of detecting and mitigating unauthorized energy usage. Additionally, a hardware module enables automatic switching between energy sources based on load conditions, ensuring cost-effective operation and enhanced security for smart home networks. By reducing human intervention, the system leverages automated decision-making to improve energy distribution, consumption patterns, and overall efficiency, presenting a scalable and robust solution for modern energy challenges.

KEYWORDS: SEM(Smart Energy management), DSM(Demand side Management), IOT(Internet of Things),sensors.

Paper Id: A419

An Efficient Machine Learning Based Approach For Email Spam Detection

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Abstract

Spam emails are still a significant challenge in the current digital communication environment. It is a major challenge for both system security and user productivity. In addition to wasting a lot of productive time, there are other potential hazards such as phishing and malware. To mitigate such a challenge, this project aims to design a proficient email spam detection system based on machine learning concepts. The data for training is based on a total of 5,000 emails, half of which are spam and half are not. The balanced data will enable a more efficient training process. Moreover, a more reliable model will be obtained. Prior to applying machine learning algorithms for training, a preprocessing step is involved in which unwanted data such as special characters and stop words are removed. It is a significant step in improving data quality. During the process of feature extraction, the TF-IDF technique is used. Using the TF-IDF technique, the importance of the words used in the emails is determined. Other basic features are also taken into consideration. Various machine learning models such as Naive Bayes, Support Vector Machine, Random Forest, Logistic Regression, Decision Tree, and K-Nearest Neighbors can be employed. The comparative analysis of the models shows that all models have good performance; however, the Naive Bayes classifier has better performance compared to other models in terms of execution speed and accuracy. The proposed system has the advantage of being simple and efficient.

Keywords: Email Spam Detection, Machine Learning, NLP, TF-IDF, Naive Bayes, Text Classification

Paper Id: A420

IntelliCivic: AI-Driven Multimedia Complaint Analytics & Governance System

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Abstract

Modern municipalities face increasing challenges in efficiently handling citizen complaints due to manual processes, lack of prioritization, and poor communication mechanisms. This paper presents *IntelliCivic*, an AI-driven multimedia complaint analytics and governance platform designed to digitize and optimize civic grievance management. The system integrates a web-based interface with machine learning algorithms to analyze complaint severity, prioritize urgent cases, and provide real-time updates to both citizens and authorities. By supporting multimedia evidence such as images and videos, *IntelliCivic* enhances decision-making accuracy and transparency. The modular architecture ensures scalability, reliability, and cloud readiness. Experimental observations indicate that AI-based prioritization can reduce response time by up to 60% while improving citizen satisfaction and administrative efficiency. The proposed solution demonstrates the potential of artificial intelligence in transforming municipal governance into a data-driven, transparent, and citizen-centric ecosystem.

Keywords: Smart Governance, Artificial Intelligence, Complaint Management System, Multimedia Analytics, Civic Technology, Machine Learning, E-Governance, Smart City Systems.

Paper Id: A421

A Smart IoT-Based Parking System with Vehicle-Aware Slot Allocation and Integrated Stolen Vehicle Detection

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Abstract

Growing number of vehicles on roads due to urbanization has made finding a parking spot very difficult. Drivers spend approximately 3.5 minutes to 14 minutes looking for a parking spot in urban areas. Additionally, up to 30% of urban traffic consists of vehicles cruising for parking. This paper proposes an enhanced Internet of Things (IoT) based smart parking system with a vehicle-aware slot recommendation mechanism which makes use of user-registered vehicle specifications to recommend appropriately sized parking spaces. Parking reservation is made through a mobile application and a QR code-based access and payment framework allows users seamless entry and exit via dynamically generated QR codes. In order to identify stolen vehicles entering the parking facility, an added security layer is provided by connecting with external law enforcement databases and generate real-time alerts for authorities.

Keywords: Smart Parking System, Internet of Things (IOT), slot Allocation, QR code System, Stolen Vehicle Detection, Real-Time Monitoring.

Paper id: A422

Image Forgery Detection Using CNN–Vision Transformer Hybrid Model

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ABSTRACT

With the rapid growth of digital image editing tools, image forgery has become a major concern in fields such as digital forensics, journalism, and cybersecurity. Traditional image forgery detection techniques based solely on Convolutional Neural Networks (CNNs) are effective in capturing local texture inconsistencies but often fail to detect global contextual anomalies in manipulated images. To address this limitation, this project proposes a hybrid deep learning approach that integrates CNN and Vision Transformer (ViT) architectures. The CNN component is employed to extract low-level spatial features such as edges, noise patterns, and compression artifacts, while the Vision Transformer analyzes global relationships between image patches using self-attention mechanisms. The combined feature representation improves the model's ability to detect various types of image manipulation, including copy-move, splicing, and inpainting. The system is trained and evaluated using publicly available datasets such as CASIA and CoMoFoD, and its performance is measured using metrics including accuracy, precision, recall, and F1-score. The proposed hybrid model is expected to achieve higher detection accuracy and improved generalization compared to standalone CNN-based methods. Additionally, the model can provide visualization of tampered regions, enhancing reliability for forensic applications. This approach demonstrates the effectiveness of combining local and global feature learning for robust and accurate image forgery detection.

Paper id: A423

Graph-Orchestrated Multi-Agent Systems for Automated Regulatory Alignment and Policy Auditing

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ABSTRACT

Regulatory compliance remains one of the most resource-intensive challenges facing modern organizations, yet it continues to depend heavily on manual processes that are slow, inconsistent, and difficult to scale. This paper proposes a Graph-Orchestrated Multi-Agent System (GOMAS) as a novel architectural framework to automate regulatory alignment and policy auditing using artificial intelligence. The core contribution of this work is the representation of regulatory policies as a dynamic knowledge graph, with specialized AI agents coordinated through graph traversal to perform end-to-end compliance checking. Each agent handles a distinct phase of the compliance pipeline — including document ingestion, policy parsing, gap detection, audit synthesis, and report generation — operating autonomously while exchanging structured outputs through a shared graph coordination layer. Retrieval-Augmented Generation (RAG) is employed to ground agent reasoning in verified regulatory sources, ensuring factual accuracy and full citation traceability. The graph structure inherently provides an explainable audit trail, as every compliance decision is traceable to a specific regulatory clause in the knowledge graph. GOMAS is designed for horizontal scalability, allowing new regulatory domains to be incorporated by expanding the knowledge graph and adding agent instances without modifying the core architecture. This paper presents the conceptual design, five-layer system architecture, six-stage workflow pipeline, enabling technologies, real-world application domains, and future research directions for GOMAS. The proposed architecture has the potential to significantly reduce compliance costs, improve audit transparency, and enable organizations to respond to regulatory changes in near real-time.

Keywords — multi-agent systems, graph orchestration, regulatory compliance, policy auditing, knowledge graphs, large language models, retrieval-augmented generation, explainable AI, RegTech, autonomous agents

Paper Id: A424

Impact of Activity Based Costing on Financial Performance.

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Abstract

Effective cost management is crucial for raising organizational effectiveness and financial performance in the cutthroat business world of today. Inaccurate product costing and bad managerial choices can result from traditional costing methods, which frequently distribute overhead costs using basic bases like labour hours or machine hours. A more dependable costing method that divides overhead expenses according to the activities that use resources during production is called Activity-Based Costing (ABC). This study's main goal is to examine how Activity-Based Costing affects a manufacturing company's financial performance. The study's foundation is secondary data gathered from production reports, cost records, and financial statements over a five-year span from 2020–2021 to 2024–2025. Financial performance was assessed using a number of financial metrics, including working capital, operating profit, net income, Return on Assets (ROA), Return on Equity (ROE), and Return on Capital Employed (ROCE). The findings show that by identifying significant activities that drive costs and facilitating precise overhead allocation, Activity-Based Costing enhances cost transparency. The study comes to the conclusion that implementing Activity-Based Costing enhances managerial decision-making, promotes better cost control, and boosts financial performance.

Keywords: Financial Performance, Cost Allocation, Activity-Based Costing, Profitability, and Cost Control.

Paper Id: A425

Sentiment Analysis of User Reviews on Invasive vs. Non-Invasive Home-Use Medical Devices: A Comparative Study Using NLP

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Abstract

This study investigates whether individuals experience greater satisfaction with invasive or non-invasive home-use medical devices by analysing customer reviews using Natural Language Processing (NLP) techniques. The study was motivated by the intuitive assumption that non-invasive devices, being pain-free and generally more affordable, would attract more positive user sentiment. However, the findings reveal the opposite: users expressed significantly higher satisfaction with invasive devices, with accuracy emerging as the dominant driver of positive experience. To conduct this comparison, the glucometer was selected as the representative invasive home-use device and the digital thermometer as the representative non-invasive device. A dataset of 1,097 customer reviews was collected from three major Indian healthcare and e-commerce platforms like Tata1mg, Amazon India, and Clinikally - covering nine brands across both device categories. Sentiment was classified as Positive, Negative, or Neutral using the TextBlob library in Python, and Aspect-Based Sentiment Analysis (ABSA) was applied across five dimensions: Accuracy, Durability, Ease of Use, Pain, and Price. Glucometers achieved a positive sentiment rate of 62.6% compared to 55.5% for thermometers, with thermometers recording more than twice the negative sentiment rate (20.1% vs. 8.5%). Aspect analysis revealed that accuracy and ease of use were the strongest predictors of positive sentiment, while pain-related concerns were almost entirely absent from the data-contradicting the assumption that invasiveness is a significant source of user dissatisfaction. These findings suggest that in the home-use medical device market, measurement accuracy and reliability outweigh comfort and price as determinants of real-world user satisfaction.

Keywords: Sentiment Analysis, Natural Language Processing, Invasive Devices, Non-Invasive Devices, TextBlob, Aspect-Based Sentiment Analysis, Healthcare Analytics.

Paper Id: A426

Review on Sidechain based IoMT model for Secure transfer of medical data

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Abstract

The Internet of Medical Things (IoMT) has revolutionized healthcare by enabling remote monitoring and efficient data management. However, ensuring secure transfer of sensitive medical data remains a significant challenge. This paper proposes a sidechain-based IoMT model that leverages blockchain technology to provide a secure, decentralized, and scalable framework for medical data exchange. Our model utilizes a primary blockchain for data storage and a sidechain for processing and validating transactions, ensuring data integrity and confidentiality. The proposed model is designed to prevent data tampering, unauthorized access, and single-point failures, thereby enhancing trust among stakeholders. We evaluate the model's performance using simulations, demonstrating its feasibility and effectiveness in ensuring secure medical data transfer.

Keywords: IoMT, Blockchain, Sidechain, Machine Learning.

Paper Id: A427

Design and Implementation of an Embedded System for Automated IV Glucose Infusion Control

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Abstract

Accurate monitoring of intravenous (IV) glucose infusion is essential for ensuring patient safety in healthcare applications. Manual monitoring methods may lead to delays and human errors in controlling the glucose level. This paper presents the design and implementation of an embedded system for automated IV glucose infusion control. The system uses a load sensor to continuously measure the weight of the glucose bottle. The sensed data is processed using the Arduino Nano to determine the glucose level condition. When the glucose level falls below a predefined threshold value, the system automatically activates the motor to control the infusion process. The system also displays real-time information on an LCD for easy monitoring. The proposed system reduces the need for continuous manual supervision by medical staff. The design is simple, cost-effective, and suitable for real-time healthcare environments. The developed system improves reliability and helps enhance patient safety.

Keywords : Embedded System, IV Glucose Infusion, Load Sensor, Arduino Nano, Automation, Healthcare Monitoring, Patient Safety

Paper Id: A428

Machine Learning Models for Latest Technological Ecosystems

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Abstract

This project proposes a smart EV charging infrastructure optimization system based on edge computing using an ESP32-driven microcontroller platform. The system employs a 12V transformer followed by a bridge rectifier and filtering stage (10mH inductor and 10μF capacitor) to generate a stable 15V DC rail that feeds a simulated EV load represented by a 100Ω 100W resistor. Real-time voltage and current sensing are implemented using a ZMPT101B AC voltage sensor and an ACS-712 current sensor, respectively, while a 5V relay and fuse provide safe switching and overcurrent protection of the EV load. A TP4056 lithium-battery charger module with an 18650 cell supplies 5V power to the ESP32 and peripherals, enabling local data processing and decision-making without reliance on continuous cloud connectivity. The transformer surface temperature is monitored using a DHT22 temperature-humidity sensor mounted directly on the core, and the ESP32 automatically turns the load ON/OFF when the temperature crosses preset thresholds, thereby preventing thermal overload. The entire setup operates as a stand-alone, cost-effective, and scalable node that can be duplicated across multiple charging points to balance charging demand, reduce grid stress, minimize waiting times, and improve charger utilization in real-time.

PAPER ID: A430

An intelligent Smart Agriculture System for Crop Recommendation, yield Prediction and Dynamic Fertilizer Optimization Using CNN and Machine Learning.

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Abstract:

Food security is dependent upon agriculture; crop production is adversely impacted by nutrient malnourishment, poor crop selection, and not making decisions timely. This project provides a Smart Agriculture Monitoring and Decision Support System that combines deep learning, machine learning, soil testing, forecasting of weather, recommendations for crops and yield predictions, fertilizers and soil health testing to provide accurate answers for agriculture. This system uses the Convolutional Neural Network(CNN) based on the MobileNet-V2 architecture to analyze leaves through image processing and identify deficiencies of nitrogen (N), phosphorus (P), and potassium (K). Along with image analysis, soil parameters (NPK values), pH, moisture) are also assessed by a Soil Health Analysis module, which computes an overall soil health score for the soil's physical condition and level of fertility. The integration of external APIs with real-time weather information for decision-making will take into account various aspects of weather patterns including temperature or humidity as an example, as well as rainfall predictions from sources like the National Weather Service (NWS). The hybrid decision maker contains both rule-based reasoning (such as if-then statements) and machine learning algorithms that produce context-aware Fertilizer Recommendations which include the type and the amount of fertilizer, as well as when is the best time to apply them. Additionally, there are multiple machine learning models embedded within the system. One example of this type of technology is using Models for Crop Recommendation which can identify which crops should be grown under the current soil and weather conditions; when those crops should be sown; and at what time those crops should be harvested. There are also Crop Yield Prediction Models that allow farmers to predict what each crop's expected yield will be prior to growing and plan accordingly. The combination of these various models provides an integrated picture of the current conditions on the farm as well as what will occur in the future. The system we have developed provides tools for transforming traditional farming practices using data derived from many different sources, and connects the various intelligent modules as part of a single integrated system to provide farmers with the means to utilise their resources more efficiently; reduce their input costs; and increase the overall productivity of their crop yield. A large number of these modules can be connected, expanded & scaled through IoT based sensor inputs providing farmers with the tools necessary for real-time, automated monitoring of their farming operations thereby providing everything needed for modern-day smart farming operations.

PAPER ID: A430

Detailed Analysis of Evolution of Electric Motor Technologies used in Electric Vehicles

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Abstract

The rapid electrification of the automotive sector has catalyzed significant advancements in electric vehicle (EV) traction motor technologies, driven by the pursuit of higher power density, overall efficiency, and long-term sustainability. This comprehensive review traces the evolutionary trajectory of EV propulsion systems, transitioning from foundational brushed Direct Current (DC) machines to robust AC Induction Motors (ACIM). While ACIMs offered enhanced durability and successfully eliminated the need for rare-earth materials, their inherent limitations in partial-load efficiency and rotor heat generation necessitated further innovation. Presently, Permanent Magnet Synchronous Motors (PMSM) dominate the commercial landscape, utilizing Neodymium-Iron-Boron (NdFeB) magnets to deliver unparalleled torque-to-weight ratios and peak operating efficiencies frequently exceeding 95%. However, volatile global supply chains and environmental concerns regarding rare-earth mineral mining have prompted a critical industry-wide paradigm shift. Consequently, recent engineering efforts are heavily focused on sustainable alternative topologies. These include Wound Rotor Synchronous Motors (WRSM) that provide dynamic field excitation for optimized high-speed cruising, and Permanent Magnet-Assisted Synchronous Reluctance Motors (PMA-SynRM) that hybridize reluctance and magnetic torque to drastically reduce rare-earth dependence. Furthermore, emerging architectures like Axial Flux machines offer extreme torque density for space-constrained, high-performance applications. Beyond fundamental electromagnetic design, the evolution of traction motors is intrinsically linked to advanced manufacturing and power electronic innovations, including precision hairpin stator windings, direct dielectric oil cooling, and the integration of wide-bandgap Silicon Carbide (SiC) inverters within unified e-axle systems. Ultimately, the future of EV motor technology relies on balancing high-efficiency electromagnetic topologies with sustainable material sourcing to ensure the viability of global electrified mobility.

Keywords: Electric Vehicle; Electric Motor; Evolution; BLDC Motor; SRM; Induction Motor; Types of EV.

Paper Id: A431

CryptVault: A Zero-Knowledge Encrypted Storage System with Blind Searchable Encryption

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Abstract

As the utilization of cloud storage expands, conventional "encryption-at-rest" methodologies continue to be significantly susceptible, primarily because of the "Trust the Provider" model, wherein service providers retain access to decryption keys. This inherent architectural weakness places user data at risk from insider threats, server vulnerabilities, and compromised privacy. Although client-side encryption presents a potential remedy, it typically gives rise to a "Search Paradox"—the local encryption of data renders it inaccessible for server-side searching, thereby necessitating a trade-off between data sovereignty and system functionality. This study introduces CryptVault, a Zero-Knowledge Content Management System, which aims to mitigate this conflict through the implementation of Searchable Symmetric Encryption (SSE) and Blind Indexing techniques. The system delegates cryptographic functions to the client via the WebCrypto API, utilizing Envelope Encryption. This approach protects files with a distinct Data Encryption Key (DEK), which is then secured by a Key Encryption Key (KEK) generated from a password. To handle multi-gigabyte datasets, CryptVault integrates Chunked Streaming Encryption, processing data in 5MB authenticated segments (AES-256-GCM) to alleviate memory limitations. Searchability is maintained by transforming keywords into irreversible "Blind Beacons" (HMAC-SHA256) before transmission. This allows the Python backend and PostgreSQL storage layer to perform high-speed metadata lookups on opaque hashes without gaining access to plaintext content or keys. Experimental results indicate that CryptVault achieves near-native search latency while ensuring a rigorous Zero-Knowledge environment, providing a robust, scalable framework for GDPR and HIPAA-compliant cloud architectures.

Keywords: Zero-Knowledge Architecture, Searchable Symmetric Encryption (SSE), Blind Indexing, Client-Side Encryption, Secure Cloud Storage

Paper Id: A432

IoT BASED INVISIBLE KEYPAD FOR ATM PRIVACY

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Abstract

The project titled “IoT Based Invisible Keypad for ATM Privacy” presents a smart and secure ATM system designed to enhance user privacy during PIN entry and prevent unauthorized access. The system integrates Arduino Uno, Ultrasonic Sensor, IR Sensor, RFID module, and Buzzer with a Python-based ATM interface and a MySQL database. The ultrasonic sensor detects the presence of the user, and authentication is performed using an RFID card. To improve security, the system displays a randomly shuffled digital keypad for PIN entry. During this process, the IR sensor continuously monitors for unauthorized persons, and if any suspicious activity is detected, the keypad becomes invisible and a buzzer alert is triggered to prevent PIN exposure. The system includes account management and ATM operation modules, allowing users to perform transactions such as withdrawal, deposit, balance enquiry, mini statement, and PIN change with secure verification. By combining IoT technology, secure authentication, and real-time monitoring, the proposed system enhances ATM security and ensures user privacy.

Keywords: IoT, ATM Security, Invisible Keypad, RFID Authentication, User Privacy, IR Sensor, MySQL

Paper Id: A433

A Unified Machine Learning Framework for Predicting Multiple Diseases from Patient Health Parameters

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Abstract

The nature of the lifestyle-related diseases requires scalable, smart, and simple clinical decision support systems to aid in early risk prediction. Most machine learning models for disease prediction are designed to work for a single disease, use fixed global models, and often lack personalization, handling of uncertainty, and deployment. Scaling the models to work for many diseases would pose a major problem. we propose a patient-based and explainable AI model for predicting risks for many diseases simultaneously. It is a full-stack model where disease-specific models are deployed as a single pipeline. This model determines which disease models to use based on the symptoms provided. This minimizes the computation required and maximizes the scalability of the predictions. It uses supervised learning models trained on structured data to make clear predictions like high risk, low risk, and requires consultation. For personalization of the predictions, the model keeps a history of each patient's prediction history of medication. This helps to personalize the predictions for the patient's and evaluate the risk for each patient. Using SHAP values to determine the features used for the prediction. All predictions and the associated uncertainty are stored for future monitoring and future predictions. This system attempts to bridge the space between both machine learning models and actual healthcare practice with a framework that integrates scalability, transparency, and personalization and many more. The prototype for the prediction of diabetes demonstrates the effectiveness of the idea, and the modularity of the framework allows for the incorporation of other diseases. Our work highlights the importance of incorporating aspects of handling uncertainty and personalization into future AI-based clinical decision support systems.

Keywords: Machine Learning, Deep Learning, Predictive Analytics, Supervised Learning, Explainable AI (XAI), SHAP (SHapley Additive exPlanations), Feature Importance, Structured Data Modelling, Personalization in Healthcare, Patient-Centric Modelling, Prediction History Tracking, Uncertainty Handling, Risk Stratification.

Paper Id: A434

Hunger Hut- Food Waste Management and Re-distribution System

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Abstract

Food waste and hunger are two major global challenges that coexist, particularly in developing countries. Large quantities of edible food are wasted daily from households, restaurants, hotels, and events, while many people continue to suffer from hunger and malnutrition. To address this imbalance, the proposed project “Hunger Hut” aims to develop a smart and efficient food donation and distribution system using modern technologies. The system provides a platform that connects food donors, non-governmental organizations (NGOs), and needy individuals in real time. The proposed system integrates both hardware and software components to ensure safe and timely food distribution. Donors can register and upload details of surplus food through a web or mobile application, after which nearby NGOs are notified for quick collection. To maintain food quality and safety, IoT-based sensors such as temperature and gas sensors are used to monitor food conditions during storage and transportation. Additionally, GPS modules are used to track delivery locations, ensuring efficient logistics and reduced delays. A centralized database and cloud platform are used to store and manage data related to food donation, collection, and distribution, thereby improving transparency and coordination. Real-time alerts and tracking mechanisms ensure that food reaches the needy before spoilage. The proposed solution is cost-effective, scalable, and suitable for smart city applications. Overall, the “Hunger Hut” system aims to reduce food wastage, enhance food security, and build a sustainable and socially responsible food distribution network.

Keywords: Food Waste Reduction, Hunger Management System, IoT-Based Monitoring, Smart Food Distribution, Real-Time Tracking, Cloud Computing, Sensor-Based Food Safety, Sustainable Smart Cities

Paper Id: A435

REPLACEMENT OF SAND WITH MARBLE POWDER IN THE PREPARATION OF CONCRETE BLOCK

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Abstract

In this present experimental study on concrete having grades of M30 are prepared by 100% replacing natural sand by Marble powder. The main cause of concern is the non-renewable nature of natural sand and the corresponding increasing demand of construction industry. River sand which is one of the basic ingredients in the manufacture of concrete has become highly scarce and expensive. Therefore, looking for an alternative to river sand has become a necessity. Hence, the Marble powder can be used as an alternative material for the river sand. Marble powder contains similar properties as that of river sand and hence accepted as a building material. The present project focuses on investigating maximum percentage replacement of river sand by Marble powder in varying equal percentages 0%, 25%, 50%, 75% and 100% for M30 mix designations. Slump cone method is taken for finding workability. The cubes and cylinders are casted for each proportion and tests conducted for obtaining the compressive strength, tensile strength of concrete.

Keywords: Tensile strength, Compressive strength, Marble powder, Slump cone test, Marble dust.

Paper Id: A436

AI-DRIVEN CARBON FOOTPRINT AUDITOR FOR PERSONAL DIGITAL HABITS USING DEEP Q-LEARNING

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Abstract

While industrial carbon emissions are heavily scrutinized, the environmental impact of personal digital habits—such as background system updates, cloud synchronization, and video streaming—remains largely invisible to the end-user. Existing digital carbon tracking solutions are predominantly static, rely on manual input, and lack active optimization mechanisms. This project presents a novel AI-Driven Carbon Footprint Auditor designed to dynamically monitor and autonomously reduce individual digital emissions in real-time. The proposed system architecture integrates a Python-based background telemetry module to track application-specific data throughput, mapping it directly to live power grid carbon intensity APIs (gCO₂/kWh). A Random Forest regression model is utilized to accurately estimate the instantaneous CO₂ footprint. The core novelty of this system lies in the deployment of a Deep Q-Network (DQN) Reinforcement Learning agent. Rather than merely observing data, the RL agent continuously evaluates the trade-off between task urgency and current grid cleanliness. By autonomously shifting non-critical, high-bandwidth tasks (e.g., 5GB OS updates) to "Green Windows"—periods characterized by high renewable energy availability—the agent creates "Greener Schedules. The system operates via a seamless backend pipeline and features an interactive Streamlit/Flutter dashboard to provide users with transparent analytics and automated action logs. Preliminary simulations indicate that this active, AI-driven intervention can reduce personal digital CO₂ emissions by up to 20-30% without compromising user experience or productivity. Ultimately, this project bridges the intention-action gap in digital sustainability, shifting the paradigm from passive environmental monitoring to intelligent, automated climate action.

Keywords: Machine Learning, Deep Learning, Green Computing, Q-Learning, Random Forest.

Paper Id: A437

A Real-Time Edge-AI Hardware Device for Multimodal Deepfake Detection and Authenticity Verification

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Abstract

The rapid advancement of generative artificial intelligence has enabled the creation of highly realistic synthetic media referred to as deepfakes. These manipulated videos and voices can imitate real individuals and are increasingly leveraged for misinformation, identity fraud, and cybercrime. Existing deepfake detection systems are primarily software-based and cloud-dependent, limiting their accessibility, privacy, and real-time usability. This paper proposes TrustLens, a portable Edge-AI hardware device designed to detect manipulated multimedia content through multimodal analysis of both audio and video signals. The system integrates a Raspberry Pi 5-based embedded computing platform with real-time media capture hardware and deep learning models capable of identifying facial manipulation artifacts and voice cloning characteristics simultaneously. The device performs on-device inference ensuring low latency and privacy preservation without cloud reliance. TrustLens analyzes visual artifacts including facial texture inconsistencies, abnormal blinking patterns, and lip synchronization mismatches, while evaluating spectral anomalies and unnatural prosody associated with synthetic speech. Detection outputs are fused using weighted aggregation to produce a unified authenticity trust score. Experimental evaluation demonstrates that multimodal analysis achieves 93.6% accuracy, significantly outperforming single-modality baselines. The system offers practical applications in banking security, digital forensics, journalism verification, and cybersecurity monitoring.

Keywords: Deepfake Detection, Edge AI, Multimodal Analysis, Raspberry Pi, Voice Cloning, Facial Manipulation, Real-Time Inference, Authenticity Verification, Deep Learning, Synthetic Media

Paper Id: A438

Spectral Warping-Based Lombard Compensation for Speech Recognition

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Abstract

Speech characteristics are significantly changed in noisy environments due to acoustic interference, reducing intelligibility. Speakers compensate by increasing vocal effort, known as the Lombard effect. This creates the mismatch between training and testing conditions in automatic speech recognition systems and degrades performance. The experimental study is carried out on Lombard audio-visual GRID database using Mel-Frequency Cepstral Coefficients (MFCC) and Glottal MFCC (GMFCC) features. Under matched conditions, accuracies of 71.43% for MFCC and 68.08% for GMFCC are achieved. Under mismatched conditions, these accuracies drop to 62.72% and 60.04% respectively. To address this degradation, four feature normalization techniques cepstral mean normalization (CMN), cepstral mean and variance normalization (CMVN), cepstral gain normalization (CGN), and quantile-based cepstral dynamics normalization (QCN) are evaluated and CGN achieving the best performance. Furthermore, a Spectral Warping-based Lombard Compensation approach is proposed, improving accuracies to 70.09% for MFCC and 65.85% for GMFCC, demonstrating its effectiveness in reducing Lombard mismatch effects.

Keywords: Lombard Effect, MFCC, GMFCC, Cepstral Gain Normalization, Spectral Warping-based Lombard Compensation.

Paper Id: A439

AI-Based Automated Meme Generation Using Multimodal Deep Learning

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Abstract

Memes have emerged as a dominant form of communication in modern digital culture, enabling users to express humor, opinions, and social commentary through a combination of images and text. However, traditional meme creation is a manual and time-consuming process that requires creativity and technical skills. This paper presents an AI-based meme generation system that automatically creates memes from a simple user-provided topic. The system integrates three key components: a caption generation module, an image generation module, and a meme assembly engine. A local language model generates context-aware and humorous captions, while a diffusion-based generative model running on a cloud GPU synthesizes visually appealing images. The meme assembly engine combines these outputs using automated styling techniques to ensure readability and consistency. The system is deployed through a web-based interface that enables real-time meme generation with minimal user effort. Experimental results show that the system produces relevant, visually coherent, and engaging memes with high consistency and low response time. The proposed approach demonstrates the effectiveness of combining natural language processing and generative image synthesis for scalable automated content creation.

Keywords: Artificial Intelligence, Meme Generation, Natural Language Processing, Diffusion Models, Multimodal Systems

Paper Id: A440

Influence of Brand Recognition and Pricing Strategies on Buying Behaviour of Schools for CCTV Solutions

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Abstract

Purpose: - This paper explores how brand recognition and pricing strategies affect the buying decision of K–12 schools in purchasing CCTV surveillance systems in Hyderabad, India. The study aims to understand which are the most relevant brand reputation, cost structures, technical features and after-sales service and external drivers (government regulations, safety concerns etc.) in this market, taking into account peer influence. **Methodology:** - In the study systematic literature approach was undertaken, emphasizing peer-reviewed studies linked to buying behaviors, adoption of security technology, and educational surveillance systems. Inclusion and exclusion criteria were considered, restricting the scope to K-12 schools in the context of Hyderabad. Academic databases such as Google Scholar, Scopus, and others were searched using keywords and Boolean strings, considering methodological rigor. **Findings:** - The findings indicated that purchasing decisions in schools are mainly shaped by affordability and the trade-off between risk reduction. Having a strong reputation and well-known brands of CCTV systems is preferred because of their perceived reliability in critical safety environments. Nevertheless, the use of pricing strategies such as value-based pricing, bundling, competitive pricing, and subscription pricing has a large effect on the scale of the system and the timing of adoption, particularly when budgets are constrained. AI analytics, remote access, total cost of ownership, and after-sales support are examples of technological capabilities that further shape purchasing decisions. The pressure for adoption of surveillance systems is driven by external forces such as community and regulatory requirements. **Originality:** - The research addresses the gap by incorporating brand-related variables with pricing theories, within the domain of school CCTV system purchasing in an emerging urban city. Focusing solely on K-12 schools in Hyderabad city, this study provides valuable context-specific insights for sellers, principals, and policymakers, while also contributing to the literature on institutional purchase process and technology adoption in educational security systems. **Keywords:** Buying behavior, CCTV, schools, factors influencing purchase decisions, brand recognition, pricing strategies, vendor selection, total cost of ownership (TCO), surveillance systems, school security systems, consumer behavior, security technology, CCTV adoption, educational institutions, decision-making, school administrators, technology adoption, brand reputation

Paper Id: A441

Analysis of Battery Integrated Solar Dryer for Agricultural Products

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Abstract

This study focuses on improving the drying efficiency of agricultural products using renewable solar energy. The system utilized maximum solar radiation of 940 W/m² during daytime, which significantly enhanced drying performance. During peak hours, temperatures reached 37°C at the inlet, 58°C at the plate, and 50°C at the outlet, increasing the moisture removal rate effectively. The product's initial weight of 5 kg was reduced to 3.65 kg during daytime drying, indicating substantial moisture loss. The drying rate was highest when solar radiation was at its peak and gradually decreased over time. The solar panel converted sunlight into electrical energy, which was stored in a battery through a charge controller. After sunset, the stored energy was used to continue the drying process. During night operation, the inlet temperature was maintained at 52°C and the outlet temperature at 45°C, ensuring effective drying conditions. The product weight further reduced from 3.65 kg to 2.45 kg, demonstrating continuous drying even without sunlight. The drying rate during battery operation ranged from 0.45 kg/hr to 0.35 kg/hr. Thus, the system effectively utilizes stored solar energy to maintain temperature and airflow, improving drying efficiency and reducing overall drying time.

Keywords: Solar Dryer, Drying Efficiency, Solar Radiation, Battery Backup System, Moisture Removal.

Paper Id: A442

Breast Cancer Detection Using Convolutional Neural Network

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Abstract

Breast cancer is one of the most common and life-threatening cancers affecting women worldwide. Early detection and accurate diagnosis are crucial to improving survival rates and reducing mortality. Traditional diagnostic methods such as mammography and biopsy are time-consuming, expensive, and sometimes prone to human error. To overcome these limitations, deep learning techniques, particularly Convolutional Neural Networks (CNNs), have emerged as powerful tools for automated medical image analysis. This project proposes a CNN-based model for the detection and classification of breast cancer using mammogram or histopathological images. The model is trained to differentiate between benign and malignant tumors, enabling faster and more accurate diagnoses. The proposed system utilizes Python and popular deep learning libraries such as TensorFlow and Keras to implement the CNN architecture, which includes convolutional, pooling, and fully connected layers for feature extraction and classification. Preprocessing steps, including image normalization and augmentation, are applied to enhance model performance and generalization. The CNN model is evaluated on benchmark breast cancer datasets using metrics like accuracy, precision, recall, F1-score, and ROC-AUC. Experimental results demonstrate that the CNN-based approach achieves high classification accuracy and robustness, offering a reliable automated solution for early breast cancer detection and supporting clinicians in effective decision-making.

Paper Id: A443

Multiple Disease Detection Using Yolo V8m Algorithm

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. Abstract

One of the most important pillars of contemporary healthcare is medical imaging, which helps doctors identify, diagnose, and track potentially fatal illnesses early on. Every day, enormous volumes of visual data are produced by imaging modalities like magnetic resonance imaging (MRI), computed tomography (CT), X-ray, mammography, and ultrasound. Although these pictures contain vital diagnostic data, but their interpretation mainly depends on skilled radiologists, which makes the diagnostic process expensive, time- consuming, and prone to human error particularly in emergency scenarios and healthcare settings with limited resources. Diagnostic errors or delays can have a direct effect on patient outcomes and, in extreme situations, may result in avoidable death. This study suggests a complete AI-based medical image diagnosis system that combines MATLAB for sophisticated offline medical analysis, a Flask-based web application, and YOLOv8 deep learning object detection models to address these issues. The system's purpose is to use medical images for automated disease detection, localization, and severity estimation. The suggested framework identifies the precise pathological regions and quantitatively estimates the severity of the disease based on detected lesion areas, in contrast to conventional computer-aided diagnosis systems that only offer binary predictions (disease present or absent). Brain tumor, pneumonia, and breast cancer are the three clinically significant diseases that the system focuses on. Each of these conditions is examined using a variety of imaging modalities, including MRI, CT, X-ray, mammography, and ultrasound. A severity computation algorithm determines the ratio between the identified disease area and the total image area after custom-trained YOLOv8 models identify abnormal regions. Diseases are classified into Mild, Moderate, and Severe stages based on this quantitative analysis, offering clinicians actionable and comprehensible diagnostic insights to help them make decisions. While MATLAB integration enables researchers and clinicians to carry out offline analysis, visualization, automation, and possible medical report generation, Flask integration enables real-time, web-based diagnosis through an intuitive interface.

Keywords: Medical Image Analysis, Deep Learning, YOLOv8, Object Detection, Disease Localization, Severity Estimation, MATLAB Integration.

Paper Id: A444

SIMULATION BASED SMART ENERGY LOAD PREDICTION AND OPTIMIZATION USING MACHINE LEARNING

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Abstract

The growing need for electricity and the difficulty of billing systems show that smart energy management solutions are needed. This paper shows how to use machine learning to predict and improve energy load consumption through simulation. The suggested system models how much energy is used by taking into account user-defined inputs like the types of appliances, their power ratings, and the hours they are used. Using these inputs, a baseline profile is made by figuring out how much energy is used over a certain amount of time. The system uses the XGBoost algorithm, a powerful gradient boosting technique, to look at consumption patterns and make predictions about energy use. This helps make predictions more accurate. Standard regression metrics are used to check the model's performance and make sure its predictions are accurate. A load-based optimization strategy is also used, which groups appliances into mandatory, semi-mandatory, and optional loads. This lets you control how much energy you use that isn't necessary. The system shows graphs that show how energy use changes before and after optimization. The results show that people used a lot less energy overall, which helped them avoid higher rates and save money on their electricity bills. This method shows how well combining simulation and machine learning works for smart energy management. It also lays the groundwork for future work on real-time energy monitoring systems.

Keywords: Machine Learning, XGBoost, Optimization, Loads, Graph .

Paper Id: A445

Real-Time Transformer Fault Diagnosis Using an IoT-Based Embedded Multi-Sensor Monitoring System

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Abstract

Power transformers are critical components in electrical power transmission and distribution systems. Unexpected faults such as overheating, excessive vibration, oil level reduction, and overcurrent can lead to serious power interruptions and equipment damage. Traditional monitoring methods rely on periodic manual inspections, which may fail to detect faults at an early stage. This work proposes an IoT-based multi-sensor transformer fault detection and condition monitoring system for real-time monitoring of transformer health parameters. The system integrates sensors to measure temperature, vibration, oil level, and load current, which are interfaced with an embedded microcontroller. The collected data is transmitted to a cloud platform through IoT communication for remote monitoring and alert generation when abnormal conditions are detected. The proposed system provides a low-cost and practical solution for improving transformer reliability and enabling timely maintenance.

Keywords: Transformer Monitoring, IoT, Embedded Systems, Fault Detection, Smart Grid.

Paper Id: A446

AI-Based Self-Healing System for Autonomous Failure Detection and Recovery

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Abstract

In modern computing environments, system reliability and uninterrupted service availability have become critical requirements for organizations that depend on digital infrastructure for daily operations. Large-scale software systems, cloud platforms, and enterprise services frequently experience failures caused by hardware malfunction, software defects, excessive workload, and network instability. Traditional failure handling methods depend on manual monitoring and administrator intervention after a fault has already occurred, often resulting in service disruption, financial loss, and reduced customer trust. To overcome these limitations, this project proposes an intelligent AI-based self-healing system capable of detecting failures autonomously and initiating recovery actions without human involvement. The system applies a Hybrid Spatio-Temporal Graph Transformer combining a Bidirectional LSTM temporal backbone with a learnable Spatial Gate to continuously monitor critical infrastructure parameters including CPU utilization, memory consumption, network latency, and error count, identifying temporal degradation patterns associated with system instability. Once a failure condition is detected, autonomous healing strategies including traffic rerouting, horizontal scaling, garbage collection flush, and service auto-recovery are activated through a validated Digital Twin simulation before atomic zero-downtime patch injection into the live system. The proposed model achieved 98.60% detection accuracy and 99.20% ROC-AUC, significantly outperforming the heuristic baseline at 81.30% accuracy. By combining AI-driven anomaly detection, causal root cause analysis, and automated recovery mechanisms, the proposed system improves operational resilience, reduces mean time to recovery, and increases infrastructure reliability across modern distributed computing environments.

Keywords: Self-Healing Systems, Spatio-Temporal Graph Transformer, Autonomous Failure Detection, Zero-Downtime Recovery, Digital Twin Validation.

Paper Id: A447

A Study on E-Commerce and Its Influence on Traditional Business

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Abstract

The accelerated growth of E-Commerce has significantly transformed the global business landscape, influencing the functioning of traditional brick-and-mortar businesses. With the increasing penetration of the internet and digital technologies, consumers are shifting towards online platforms for convenience, wider product choices, and competitive pricing. This study aims to analyze the influence of e-commerce on traditional business operations, customer preferences, and overall market dynamics. The research adopts a descriptive and empirical approach. Primary data were collected from respondents through structured questionnaires, along with secondary data from journals, articles, and reports. The study examines key factors such as changes in consumer buying behaviour, competitive pressure, pricing strategies, and the adoption of digital tools by traditional businesses to sustain in the evolving market. While it intensifies competition and reduces footfall in physical stores, it also encourages innovation, digital adaption, and improved customer engagement strategies. Many traditional businesses are integrating online channels to remain competitive and expand their market reach. The e-commerce and traditional business models are essential for sustainable growth. Businesses that adopt a hybrid approach by combining online and offline strategies are more likely to succeed in the current digital era.

Keywords: E-Commerce, Traditional Business, Consumer Behaviour, Digital Transformation, Business Performance.

Paper Id: A448

Touch-Free Tilak Dispensing System Using an IoT Based Embedded Sensor Platform for Temples

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Abstract

In temples and religious places, applying tilak is a common ritual for devotees. Traditionally, tilak is applied by hand, which raises hygiene concerns, especially in crowded areas where many individuals use the same container or priest. Recently, the demand for contactless systems has grown to ensure cleanliness and safety. This paper presents a Touch-Free Automated Tilak Dispensing System that uses sensor technology to provide a hygienic and efficient way to apply tilak without physical contact. The system uses an infrared (IR) sensor to detect a user's hand or forehead, activating a microcontroller to dispense a small amount of tilak automatically. The design minimizes waste, controls dispensing, and enhances user convenience. This system is compact, affordable, and suitable for use in temples, religious gatherings, and public spiritual spaces. By combining automation and hygiene, the proposed system improves the traditional practice while respecting cultural values.

Keywords: Touch-Free System, Tilak Dispenser, IR Sensor, Arduino, Automation, Hygiene.

Paper Id: A449

CareConnect Platform: A Unified Telehealth Ecosystem

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Abstract

The Care Connect system is designed to provide an integrated and intelligent digital healthcare platform that enhances coordination between patients, doctors, and emergency services. Traditional healthcare management often suffers from fragmented systems, delayed communication, and lack of real-time assistance, which can negatively impact patient outcomes and response efficiency during critical situations. To address these challenges, the proposed system incorporates a web-based architecture with role-based access, enabling secure interaction among multiple stakeholders. It integrates features such as appointment scheduling, digital health record management, medication reminders, and post-operative monitoring to support continuous patient care. Furthermore, the system leverages techniques from Artificial Intelligence and Web Development to provide preliminary diagnosis suggestions, automate routine processes, and ensure responsive performance across devices. An emergency alert mechanism with real-time notification and geolocation support further strengthens the system's ability to handle critical scenarios efficiently. Overall, Care Connect aims to improve healthcare accessibility, patient engagement, and service delivery through a unified, scalable, and user-friendly digital solution.

Keywords: Healthcare Management System, Artificial Intelligence, Web Application, Patient Monitoring, Emergency Alert System, Digital Health Records, Smart Healthcare, Real-Time Communication.

Paper Id: A450

HEMOLINK – A BLOOD DONATION TRACKER SYSTEM

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Abstract

Blood shortages, delayed coordination between hospitals and donors, and limited real-time visibility and these issues continue to pose serious risks in emergency healthcare delivery. Many healthcare institutions still depend on fragmented donor registries and manual communication methods which results in delays in identifying compatible donors during critical situations and sometimes results in losses of lives. HemoLink is a web-based blood- donation coordination and management which is a platform designed to connect hospitals, blood banks, and registered donors in real time for rapid request handling and verified matching. The system prioritizes urgent cases and tracks request fulfillment status, maintains donor eligibility and hospital inventory records through centralized dashboards. Secure authentication, workflow management based on roles, and audit-ready transaction logs help to provide accountability, privacy, and integrity of data throughout the donation process. The platform will be able to integrate with future blockchain- enabled traceability and predictive analytics for purposes of forecasting demand and optimizing supply. HemoLink's ability to increase transparency, decrease response time, and eliminate information gaps will help to reduce the amount of blood wasted as well as improve coordination of emergency healthcare.

Keywords— Blood Donation System, Real-Time Matching, Healthcare Coordination, Blockchain Integration, Supply Chain Optimization, Emergency Response, Traceability, Predictive Analytics.

Paper ID: A451

Structure Conformational, Spectroscopic, Electronic, Molecular Docking and Computational investigation of Citric Acid Anhydrous

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Abstract

Citric acid anhydrous (CAA) is a biologically significant compound with promising antimicrobial potential. This study presents a comprehensive investigation of its structural, conformational, spectroscopic, electronic, and molecular docking properties using combined experimental and Density Functional Theory (DFT) methods at the B3LYP/6-311G(d,p) level. The optimized geometry shows strong agreement with experimental X-ray diffraction data. Potential energy surface analysis identifies the most stable conformer at a dihedral angle of 216°. Vibrational analysis confirms 57 normal modes, consistent with theoretical expectations. FT-IR, UV–Visible, and NMR studies exhibit excellent correlation with computed spectra. HOMO–LUMO analysis reveals an energy gap of 6.518 eV, indicating moderate stability and reactivity. NBO analysis highlights significant intramolecular charge transfer interactions with high stabilization energy. Molecular docking against antimicrobial targets (1W78 and 1W7K) demonstrates favorable binding affinity. These findings underscore the structural stability and biological relevance of CAA for potential pharmaceutical and antimicrobial applications.

Keywords: Citric Acid Anhydrous, DFT, Spectroscopic analysis, HOMO–LUMO, NBO analysis, Molecular docking, Antimicrobial activity.

Paper Id: A452

AI-Based Assessment Hub

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Abstract

With the rapid transition towards remote education and digital assessments, ensuring academic integrity and maintaining student engagement during online examinations have emerged as a critical challenge for educational institutions and certification bodies. Traditional manual proctoring methods are often resource intensive and lack the scalability required for modern remote environments. This paper presents a comprehensive AI-Powered Online Proctoring and Assessment System designed to provide a highly secure, automated, and scalable platform for remote assessments. By leveraging advanced artificial intelligence (AI) and machine learning (ML) methodologies—including Computer Vision and Deep Neural Networks—the proposed system actively monitors test-takers in real-time to detect and prevent unauthorized behaviors. The system's core capabilities include continuous facial recognition for identity verification using dlib and OpenCV, person counting via Haar Cascades to flag the presence of unauthorized individuals, and advanced object detection using the YOLO (You Only Look Once) framework to identify prohibited items such as mobile devices or textbooks. Furthermore, the application restricts access to unauthorized system resources to maintain a secure exam environment while providing real-time violation notifications to administrators. To enhance user motivation and interactive learning, the platform incorporates a gamification framework featuring a comprehensive ranking system tailored to individual courses and categories. Experimental deployment of the architecture demonstrates high accuracy and low latency in anomaly detection, confirming its reliability in maintaining strict assessment standards. The study further discusses the system architecture, its practical applications in modern e-learning ecosystems, and the future directions of AI-driven educational security.

Keywords: Artificial Intelligence, Online Proctoring, Face Recognition, Object Detection, YOLO, Remote Assessment, Machine Learning, Gamification, Leaderboard Ranking.

Paper Id: A453

PRIVACY-FIRST DECENTRALIZED CLOUD STORAGE USING BLOCKCHAIN AND ADVANCED CRYPTOGRAPHY

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Abstract

In the modern era of digital transformation, cloud storage has become a cornerstone for managing data and supporting online services; however, traditional centralized cloud storage systems present significant security and privacy challenges. These centralized models rely on a single authority, usually the service provider, to manage authentication, storage, and access control, which creates a single point of failure and increases the risk of data breaches, unauthorized access, and service disruptions. Users are forced to place complete trust in third-party providers, often without transparency regarding how their sensitive information is stored, shared, or protected. The reliance on centralized servers not only increases vulnerability to cyberattacks but also limits user control over personal data, encryption keys, and access permissions. To address these challenges, the proposed system introduces a decentralized and cryptographically secure framework for cloud data storage and sharing, leveraging cutting-edge technologies such as Blockchain, the Interplanetary File System (IPFS), and advanced cryptographic techniques. Elliptic Curve Cryptography (ECC) is employed to encrypt user data, ensuring confidentiality while enabling secure access for authorized parties. IPFS provides distributed, tamper-resistant storage, eliminating dependence on a single server and reducing the risk of data loss or corruption. Blockchain technology records metadata, access logs, and ownership information, offering transparent and immutable verification of all transactions. Proxy re-encryption and zero-knowledge proofs are integrated to facilitate privacy-preserving data sharing, allowing users to grant access without exposing encryption keys or sensitive credentials. This framework empowers users with complete control over their data, enabling flexible access management, verifiable authorization, and traceable activity while maintaining privacy and security. The proposed system ensures high scalability, resilience, and integrity, making it suitable for individual users and organizations that require secure, trustworthy, and privacy-preserving cloud storage solutions. By combining decentralized storage, blockchain verification, and cryptographic mechanisms, the system mitigates the limitations of centralized platforms, enhances user trust, and provides a robust environment for secure data sharing.

Keywords: Cloud Computing, Cryptography, Block Chain, IPFS, ECC.

Paper Id: A454

GLOBAL ECONOMIC DEVELOPMENT AND THE OPPORTUNITIES AND CHALLENGES OF THE MODERN ECONOMY

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ABSTRACT:

Foreign trade plays a crucial role in the economic development of nations, enabling efficient resource utilization, market expansion, and stimulating growth. Business economics provides a framework for understanding the effects of trade policies and market dynamics on international trade. Recent trends in globalization, technological advancements, and digitalization have reshaped trade patterns and business operations. Engaging in foreign trade drives global economic development through specialization, increased productivity, job creation, and technology transfer, ultimately fostering competitive markets and improving living standards. However, the modern economy faces significant challenges, including trade imbalances, protectionist policies, economic instability, environmental concerns, and unequal distribution of trade benefits. From a business economics perspective, organizations must analyze market conditions, demand trends, cost structures, and government regulations to make informed international trade decisions. Those that adapt to global market changes and embrace innovative strategies can leverage new opportunities in emerging markets and digital platforms. Overall, understanding the role of foreign trade and business economics is essential for navigating today's economic landscape, encouraging international cooperation, sustainable practices, and effective policies to maximize benefits while addressing potential risks.

Keywords: Foreign Trade, Business Economics, Global Economic Development, International Trade, Globalization, Opportunities, Challenges, Modern Economy.

Paper Id: A455

Shock Wave–Assisted Advanced Processing of Concrete Materials Using an Optimized Conical Nozzle for High-Performance Construction Applications

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Abstract

Hollow blocks are extensively used in modern construction due to their lightweight structure, thermal insulation properties, and cost efficiency. However, conventional fabrication methods such as manual compaction and vibration often lead to non-uniform density, improper bonding of materials, and reduced mechanical strength. To overcome these limitations, this project proposes an innovative technique based on the expansion of shock waves using a designed conical nozzle for improved hollow block fabrication. Shock waves generated inside a shock tube produce high-pressure impulses capable of enhancing particle rearrangement and compaction within the mixture of M-sand and cement. The conical nozzle plays a critical role by expanding and directing the shock waves uniformly over the material surface, ensuring controlled energy distribution and minimizing localized stress concentration. This process improves particle packing, reduces void formation, and strengthens inter-particle bonding, resulting in enhanced compressive strength and durability of hollow blocks. The study focuses on the design and optimization of the conical nozzle to achieve efficient shock wave expansion and uniform pressure application. Compared to conventional methods, the proposed system offers faster production, improved material utilization, reduced cement consumption, and energy-efficient operation. The developed approach provides a sustainable and technologically advanced solution for modern construction material manufacturing.

Keywords: Hollow Block, Shock Waves, Conical Nozzle, Vicker's hardness, M-Sand and Cement.

Paper Id: A456

Talent Management Practices and its Impact on Organization Performance on B.K Power Industry

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Abstract

Talent management has become an essential strategic function in modern organizations as businesses increasingly rely on skilled and capable employees to achieve competitive advantage. This study examines the concept of talent management and its impact on organizational performance. Talent management refers to the systematic process of attracting, identifying, developing, motivating, and retaining talented employees to meet organizational goals effectively. Organizations that focus on structured talent management practices are better able to utilize human resources efficiently and improve overall productivity. The purpose of this study is to analyze how talent management practices such as recruitment, training and development, performance management, employee engagement, and succession planning contribute to improved organizational outcomes. Effective talent management not only enhances employee skills and competencies but also promotes job satisfaction, commitment, and motivation among employees. As a result, organizations experience reduced employee turnover, higher productivity, and improved operational efficiency. Furthermore, the study highlights that organizations investing in talent development and leadership building are more adaptable to market changes and innovation demands. By aligning employee capabilities with organizational strategies, companies can strengthen their competitive position and achieve long-term sustainability. Therefore, talent management plays a vital role in improving organizational performance and ensuring continuous growth in a dynamic business environment.

Keywords: Talent Management, Organizational Performance, Employee Engagement, Human Resource Development, Recruitment, Training and Development, Leadership Development, Workforce Productivity.

Paper ID: A457

Human-in-the-Loop Explainable AI Model for Hybrid, Trustworthy Financial Decision-Making

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Abstract

In response to the growing complexity of financial regulations and the limitations of purely data-driven models, this study proposes a Human-in-the-Loop Explainable Artificial Intelligence (AI) framework designed to enhance trustworthy financial decision-making. The model integrates rule-based reasoning, machine learning techniques, and human oversight to ensure transparency, accountability, and compliance with regulatory standards. Unlike traditional black-box models, the proposed system emphasises interpretability and policy alignment alongside predictive accuracy. The architecture combines neural networks for risk prediction with symbolic reasoning components such as regulatory knowledge graphs and constraint-based inference mechanisms. These components work together to evaluate financial transactions, detect anomalies, and ensure adherence to regulatory policies. A human-in-the-loop approach is incorporated to validate system outputs, provide domain expertise, and iteratively refine both the model and the rule base. To assess the effectiveness of the proposed system, a prototype compliance engine was developed and tested using simulated financial scenarios, including fraud detection and policy compliance checks. Explainable AI techniques were integrated to provide clear decision traces, enabling users to understand the reasoning behind each outcome. Feedback from domain experts was used to improve system usability, transparency, and reliability. Experimental results demonstrate that the hybrid approach significantly improves decision traceability, reduces regulatory violations, and enhances user confidence compared to standalone machine learning models. The study concludes that combining human expertise with neuro-symbolic AI provides a robust framework for developing trustworthy and compliant financial systems.

Keywords: Human-in-the-Loop, Explainable AI, Financial Compliance, Neuro-Symbolic AI

PAPER ID: A458

CHALLENGES FACED BY FIRST-GENERATION ENTREPRENEURS IN TAMIL NADU

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Abstract

Entrepreneurship plays a vital role in driving economic growth, fostering innovation, and creating employment opportunities. In recent years, Tamil Nadu has established itself as a dynamic hub for industrial development and startup activity. Within this environment, first-generation entrepreneurs' individuals who start businesses without a family business background have emerged as significant contributors to the state's economic progress. Despite their potential, their journey is often challenging. Unlike those from established business families, they must build everything independently, including financial resources, professional networks, and practical business knowledge. They frequently encounter barriers such as limited access to funding, lack of experience, complex regulatory procedures, intense market competition, and socio-cultural pressures. This paper examines these challenges using secondary data and analytical insights. It also reviews existing government support systems, identifying key gaps in awareness, accessibility, and implementation. The study concludes by recommending practical measures to strengthen the entrepreneurial ecosystem, including improved financial access, mentorship programs, simplified regulations, and enhanced policy execution. These steps are essential to empower first-generation entrepreneurs and improve their chances of long-term success.

Keywords: First-generation entrepreneurs, Tamil Nadu, startup challenges, MSMEs, entrepreneurship development

Paper Id: A459

Regulating Online Gaming: Behavioral Outcomes of India's 2025 Ban

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Abstract

Real money and fantasy sports games was a rapidly growing industry in India with millions of active users. These games are easily accessible through mobile phones and offers money against entry fees had a profound influence on the youth of the country. Arguing that these games had become addictive and were causing financial distress among people, Government of India to pass “Promotion and Regulation of Online Gaming Act, 2025”. This paper seeks to study the impact this has had on young adults, mainly college students who were a key group of users of these fantasy sports gaming platforms. The objective of the study is to analyze the changes in spending pattern, motivation for participation, time spent and post ban substitution pattern in college students. The study focuses mainly on students and working professionals in the age group of 18-30. Data was collected through circulating a carefully structured Google form which got 102 responses. The questionnaire collected information on expenditure patterns, frequency of usage, motivation, allocation of money post ban and other significant areas. The findings suggest that most of the people who engaged, engaged with the goal of making money but the returns have been minimal. And post the ban most of them have turned to invest their money into their hobbies. It is also interesting to note that almost 85% of the participants have turned away from betting post the ban. The study concludes that the ban on online games have brought about a significant change in the behavior and financial engagement pattern of young adults with online gaming platforms. There is a significant decline in participation and allocation of money. This shows that timely and targeted policy intervention can promote more responsible behavioral and financial decisions in the targeted demographic.

Keywords: Online gaming, Behavioral change, Financial impact, Policy intervention, Post-ban substitution.

PAPER ID: A460

Rakshika: An AI-Driven Wearable Guardian System for Women's Safety

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Abstract:

Women worldwide continue to face significant safety challenges in public spaces, exacerbated by delayed emergency responses and insufficient real-time monitoring. Existing solutions often lack timely alerts, seamless integration with authorities, and proactive threat detection, leaving women vulnerable during critical moments . Rakshika introduces a comprehensive, AI-powered wearable safety system designed to address these gaps on a global scale. The solution leverages advanced IoT devices equipped with sensors, cameras, and GPS to continuously monitor environmental conditions and user activity. By utilizing state-of-the-art machine learning and deep learning frameworks, Rakshika enables real-time threat detection, unsafe zone identification, and recognition of irregular behavioral patterns. The system incorporates robust user voice recognition for discreet, hands-free emergency activation and can intelligently guide users to the nearest safe area during emergencies . A key innovation is Rakshika's integration with international emergency alert frameworks, such as Amber Alert, facilitating the rapid dissemination of critical information to authorities and the public. Its advanced geospatial analysis capabilities provide real-time unsafe zone detection and optimal safe route navigation, while secure video and location sharing enhance situational awareness for both users and responders . By combining proactive AI-driven threat analysis, seamless emergency integration, and user-centric features, Rakshika aims to significantly reduce emergency response times, empower women to navigate public spaces with confidence, and set a new standard for personal safety solutions worldwide.

Paper Id: A461

AUTOMATIC TUBERCULOSIS PREDICTION WITH CHEST XRAY USING DEEP LEARNING

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Abstract:

This project proposes an automated TB prediction system using this technology. The system will be used to examine chest X-ray images and determine whether they are TB-positive or normal images. The proposed system will make this diagnosis using gated attention along with a 3D U-Net framework. The proposed system is designed to help healthcare workers and is said to achieve an accuracy rate of 99.96%, which is significantly more accurate compared to other techniques. Tuberculosis, or TB, is one of the most common infectious diseases in the world. It is a critical health concern, especially in developing countries. The detection and timely treatment of this disease are critical to control the spread of this disease. In general, the detection of this disease is carried out using laboratory tests, including sputum tests and the manual processing of chest X-ray images by radiologists. However, this may take time and may be limited by the availability of trained medical professionals. In recent years, deep learning techniques have shown significant improvements in the field of medical image processing. The present project suggests an automatic system for TB prediction using deep learning techniques. The system will be based on analyzing the images obtained from a chest X-ray and will classify the images as either TB-positive or normal. The system will be based on g to analyze the images and will classify the images based on gated attention based 3D unet. The system will be able to provide assistance to healthcare workers in the detection of this disease, and the results show that the system will be able to provide 99.96% accuracy, which is much better than existing systems.

Keywords: Tuberculosis (TB) detection, Chest X-ray analysis, Deep learning, Gated attention 3D U-Net, Medical image classification, Automated diagnosis, Public health, Early detection.

Paper Id: A462

Movie Language Enhancement Tool for Non-Native Speakers

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Abstract

Learning a new language effectively often requires exposure to natural conversations and real-life contexts rather than memorizing isolated vocabulary or grammar rules. This project introduces an AI-powered desktop application that helps users learn English naturally while watching movies in their original English language. The system allows users to pause at any moment and receive an intelligent breakdown of the dialogue being spoken. Using AI analysis, the application explains the simple meaning of sentences, highlights tone and context, identifies useful vocabulary, idioms, and commonly used expressions, and suggests alternate ways to say the same idea. By integrating subtitle analysis with an AI language model, the application transforms passive movie watching into an interactive language-learning experience. In addition to sentence breakdowns, the application provides a conversational chatbot that allows learners to ask follow-up questions about the dialogue, vocabulary, or usage in different situations. The core objective of the project is to help learners understand how English is naturally spoken and to encourage them to reuse real conversational patterns instead of constructing sentences word-by-word. By observing how phrases and sentence structures are used in authentic contexts, learners can gradually internalize common language templates and apply them in their own communication. This approach supports intuitive language acquisition and aims to bridge the gap between theoretical learning and practical speaking ability.

Keywords: AI-powered application, Language learning, Subtitle analysis, Dialogue breakdown, Chatbot integration, Vocabulary extraction, Conversational patterns.

Paper Id: A463

CONTEXT-AWARE PPE DETECTION FOR CONSTRUCTION SITE SAFETY USING ENHANCED YOLOV11

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Abstract

Construction sites are unsafe places for anyone working there with many different types of risk associated with exposure to heavy equipment, unsafe work practices and a lack of safety measures. When you use personal protective equipment (PPE) such as hard hats, safety vests, gloves, boots, masks it will help reduce injuries and accidents. Manually monitoring PPE compliance for workers on a construction site is often difficult because there are many people on a site and supervision is sometimes not possible. This project's goal is to create an intelligent PPE detection system that uses an improved YOLOv11 Deep Learning Model for real time analysis of live video feeds from cameras on a construction site that will automatically verify if workers are wearing appropriate PPE. The PPE detection system will identify multiple PPE items that each worker is wearing in real time and will then classify workers as either compliant or non-compliant with safety regulations. When a worker is non-compliant, the system will send an alert via SMS and push notification to the appropriate supervisor to allow for quick corrective action. This system has been designed to operate in various challenging conditions that typically exist on a construction site such as low light levels, densely populated areas, and partially obstructed views. The proposed system provides continuous automated monitoring of PPE compliance which in turn enhances workplace safety, helps ensure regulatory compliance, minimizes workplace accidents, and contributes to a safer construction job site for all.

Keywords: PPE Detection, YOLOv11, Deep Learning, Construction Site Safety, Real-time Monitoring, Computer Vision, SMS Alert, Compliance Classification

Paper Id: A464

Energy Recovery System in Hybrid Vehicle

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Abstract

An energy recovery system in hybrid vehicles is designed to capture energy that would otherwise be lost during braking or deceleration and convert it into useful electrical energy. This process commonly achieved through regenerative braking. It uses the electric motor as a generator to transform kinetic energy from the wheels into electricity. The generated energy is then stored in the vehicle's battery and reused. By recovering and reusing energy, the system improves fuel efficiency, reduces emissions, and enhances overall vehicle performance. Energy recovery systems play an important role in making hybrid vehicles more sustainable and energy efficient.

The study examines the working principles, design considerations, and efficiency of different energy recovery methods. It also explores the integration of electric motors and control systems that enable seamless energy conversion. A comparative analysis is presented to highlight the performance improvements in fuel efficiency and emission reduction achieved through these systems.

Keywords: Motor, Hybrid vehicles, Energy recovery system, Regenerative breaking .

Paper Id: A465

An Adaptive Fraudnet Detecting for False Data Injection Attack in Financial Transction

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Abstract

This paper presents a machine learning based framework for real time detection of fraudulent financial transactions using the XGBoost algorithm. The system integrates a web based transaction platform with an intelligent backend model that analyzes user behavior and transaction patterns to identify anomalies. Authenticated users initiate transactions by providing recipient details and amounts, while each activity is recorded with metadata such as timestamp, IP address, and transaction type. Collected data undergoes preprocessing and feature engineering to derive attributes including frequency, temporal patterns, and anomaly indicators. These features are used to train a robust classifier capable of predicting fraudulent activity in real time. A decision module evaluates predictions and enforces actions, allowing legitimate transactions while blocking suspicious ones. This approach enhances financial security, reduces risk, and provides a scalable solution for modern digital payment systems through efficient integration of machine learning and web technologies. The proposed model demonstrates strong adaptability to evolving transaction behaviors and supports continuous learning through updated datasets. Its modular design ensures easy deployment and scalability across diverse financial applications. By combining accuracy, speed, and automation, the system contributes to reliable and proactive fraud prevention in dynamic digital ecosystems and enhances user trust and operational efficiency significantly across various real world financial environments.

Keywords: fraud detection, XGBoost, machine learning, financial security, anomaly detection, real time systems.

Paper Id: A466

Effective Inventory Management in e-commerce Businesses

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ABSTRACT

Effective inventory management has become a crucial factor in ensuring the growth and sustainability of e-commerce businesses, where customer expectations for fast delivery, product availability, and seamless service are continuously increasing. Operating in a highly dynamic environment with fluctuating demand makes efficient inventory control both challenging and essential. This paper discusses key inventory management techniques such as Just-in-Time (JIT), Economic Order Quantity (EOQ), and ABC analysis, which enable organizations to maintain optimal stock levels while minimizing costs. It also emphasizes the significance of demand forecasting through data analytics to better understand customer behaviour and improve planning accuracy. Furthermore, the paper examines the role of advanced technologies, including artificial intelligence, automation, and real-time tracking systems, in transforming inventory management practices by enhancing accuracy, reducing errors, and supporting better decision-making. Despite these advancements, e-commerce businesses continue to face challenges such as supply chain disruptions, seasonal demand fluctuations, high holding costs, and the risk of overstocking or stockouts. Organizations adopting integrated and technology-driven inventory management systems can achieve improved stock accuracy, faster order fulfilment, and better coordination across the supply chain. Additionally, the use of data analytics contributes to more accurate demand prediction, reducing excess inventory and minimizing stock shortages. Overall, effective inventory management plays a vital role in enhancing operational efficiency, improving customer satisfaction, and achieving long-term competitive advantage in the e-commerce sector.

Keywords: Inventory Management, E-Commerce, Just-in-Time (JIT), Economic Order Quantity (EOQ), ABC Analysis, Demand Forecasting, Data Analytics, Supply Chain Management, Automation, Customer Satisfaction.

Paper Id: A467

FarmEquip: Smart Agricultural Machine Booking System

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Abstract

The FarmEquip system is a smart web-based agricultural machine booking and analytics platform designed to improve the accessibility and management of farming equipment for small and medium-scale farmers. In the agricultural sector, many farmers face difficulties in obtaining modern machinery due to high ownership costs, lack of availability, poor coordination, and dependence on traditional rental methods. With the growing need for digital transformation in agriculture, platforms like FarmEquip play an important role in connecting farmers and machine owners through a centralized and transparent system. This paper presents the design and development of an online agricultural machine booking system that enables farmers to search, compare, and book machines based on availability, location, and pricing. The system also allows machine owners to register and manage their equipment efficiently while providing administrative control for monitoring and approval. In addition, an analytics module is integrated to generate insights related to machine usage, booking trends, and operational efficiency, supporting data-driven decision-making. The study discusses the system architecture, implementation technologies, core modules, and practical significance of the proposed solution in modernizing agricultural services. It further highlights the benefits, limitations, and future scope of the platform in promoting smart agriculture and sustainable resource utilization.

Keywords: Smart Agriculture, Machine Booking System, Web-Based Platform, Django, MySQL, Analytics.

Paper ID: A468

Deepfake Technology: Call for New Criminal Regulation with References to Synthetic Media

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Abstract

The digital world has changed a lot because to advancements in artificial intelligence. Deepfake technology which utilizes AI to change photographs, movies, and audio recordings to make fake but very realistic material is one of the most contentious things to happen in the last few years. Deepfakes may be utilized creatively in entertainment and media, but people are becoming more and more worried about how they are being used. Deepfake technology, a quickly changing type of AI-generated fake media, has become a big danger to people's dignity, the integrity of democracy, and the criminal justice system in India. Deepfakes make it possible to make fake audio, video, and picture content that seems very real. This makes it easier for people to commit crimes including identity theft, financial fraud, cyber extortion, false information about elections, and intimate images that aren't consensual. The Bharatiya Nyaya Sanhita, 2023 (BNS) is a big step forward in India's criminal law reform, however it doesn't clearly define or make it illegal to make and spread fake media on purpose. This loophole in the law makes many worried about protecting victims, allowing evidence to be used in court, the ability of investigators to do their jobs, and fair punishment. This study critically analyses the relevance of current BNS rules concerning forgery, cheating, defamation, and cyber-enabled offenses in relation to deepfake-related damages, emphasizing conceptual uncertainties and enforcement difficulties. It advocates for a systematic reform strategy that encompasses a precise statutory delineation of synthetic media offenses, tiered punishments, digital forensic standards, and accelerated procedural protections for victim restitution. India presently lacks a dedicated legal framework to combat the exploitation of deepfakes, depending predominantly on overarching cyber legislation and criminal statutes. This essay looks into deepfake technology, the dangers of using it wrong, the problems with India's current legal system, and the necessity for a complete regulatory response right now. A coordinated legislative response under BNS is essential to guarantee accountability, enhance institutional resilience, and maintain the rule of law in India's digital age.

Keywords: Deepfake technology, artificial intelligence, synthetic media, digital forensic, cybercrime.

Paper Id: A469

Smart Respiratory Masks with Ultrasonic Mist Maker and Temperature Control

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Abstract

Respiratory masks are widely used for personal protection and healthcare applications, especially in environments exposed to airborne pollutants and infectious diseases. However, prolonged use of conventional masks often causes discomfort such as skin irritation, dryness, and breathing difficulty due to poor humidity and temperature regulation inside the mask. To address these issues, researchers have explored the integration of humidification and temperature control technologies into respiratory mask systems. This survey paper reviews recent developments in mist-based respiratory masks that utilize ultrasonic mist generation and embedded temperature control mechanisms to improve breathing comfort. The system maintains proper humidity levels and regulates the temperature of inhaled air, thereby reducing dryness and skin irritation during long-term mask usage. Various technologies including ultrasonic mist makers, sensors, microcontrollers, and wearable healthcare systems are discussed.

Keywords— Respiratory Mask, Ultrasonic Mist Maker, Temperature Control, Humidification, Wearable Healthcare, Embedded Systems, Skin Irritation Reduction.

Paper Id: A470

Embedded IoT-Based Vehicle Accident Detection and Emergency Alert System

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ABSTRACT

Road accidents are a major cause of fatalities worldwide, often due to delayed emergency response. Immediate detection and reporting of accidents can significantly reduce the loss of human life. This paper proposes an embedded IoT-based vehicle accident detection and emergency alert system for realtime monitoring and rapid response. The system integrates multiple sensors such as an accelerometer, vibration sensor, and GPS module with a microcontroller to detect accident conditions. When an abnormal event such as sudden impact, rollover, or collision is detected, the system automatically sends an alert message along with the vehicle's location to emergency contacts and nearby hospitals through IoT communication technologies like GSM or Wi-Fi. The proposed system offers a low-cost, reliable, and efficient solution for improving road safety and ensuring timely medical assistance.

Paper Id: A471

AI Resume Builder

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Abstract

In the modern job market, resume building plays a crucial role in candidate selection, especially with the increasing use of Applicant Tracking Systems (ATS) by recruiters. However, many candidates face challenges in creating structured, ATS-friendly, and professionally optimized resumes. Existing resume builders rely on static templates and lack intelligent guidance, real-time feedback, and personalization based on job requirements. This paper presents an AI-powered Resume Builder that integrates intelligent content generation, real-time preview, and ATS optimization. The proposed system leverages advanced language models to generate professional summaries, suggest improvements, and analyze resume content for ATS compatibility. It provides multiple customizable templates and dynamic rendering to enhance visual presentation. The system architecture includes a React-based frontend, Firebase for authentication, Supabase for data persistence, and a backend integrated with AI services. The platform enables users to create, edit, preview, and export resumes seamlessly in a professional format. Experimental observations indicate significant improvements in resume quality and creation speed compared to traditional methods. Unlike static tools, this system provides real-time AI feedback and adaptive personalization based on job descriptions, demonstrating the potential of integrating artificial intelligence into career tools to assist users in building effective, industry-ready resumes.

Keywords: Artificial Intelligence, Resume Automation, Resume Builder, ATS optimization, Career Assistance, Employability Enhancement.

Paper Id: A472

AI-Enhanced Agile Task and Sprint Management System with Predictive Sprint Analytics

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Abstract

One of the most challenging aspects of Agile software development to effectively manage is the sprint planning activity. This is despite the ubiquity of the Agile methodology for software development. The ineffectiveness of the current approach to Agile software development is manifested through the occurrence of estimation errors, spillovers, and uneven task distribution. This paper presents an AI Enhanced Agile Task and Sprint Management System. This system utilizes the predictive power of AI to improve the accuracy of the sprint outcome prediction. The proposed system utilizes the historical sprint outcome data to predict the outcome of the upcoming sprints. This prediction will be used to improve the balance of the tasks allocated to the team before the commencement of the upcoming sprint. The proposed approach has been experimented using the available data sets, yielding improved results compared to the traditional approach.

Keywords: Agile Project Management, Sprint Analytics, Machine Learning, Task Prediction, Artificial Intelligence, Software Engineering

Paper Id: A473

AI-POWERED ENERGY MONITORING FOR SMART HOMES AND SMALL BUSINESS

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Abstract

This an intelligent energy monitoring and management system designed to track real-time power consumption of individual appliances in households and small businesses using AI and smart sensor technology. The system aims to provide detailed insights into energy usage by identifying high-power-consuming devices and analyzing consumption patterns. By leveraging predictive analytics, the system forecasts energy demands, enabling users to optimize appliance usage and reduce unnecessary power consumption. A user-friendly mobile application is integrated to allow remote monitoring and control of appliances, as well as to deliver instant monitoring and control regarding abnormal energy usage or device malfunctions. The system's AI-driven users in making informed decisions to lower electricity costs, enhance operational efficiency, and minimize energy wastage. Furthermore, it supports sustainable energy management by promoting responsible consumption habits and reducing power usage. Through real-time monitoring, predictive analysis, and intelligent automation, this system contributes to cost-effective and environmentally conscious energy utilization, making it highly beneficial for both residential and small business applications.

Keywords: Intelligent Energy Monitoring System, Artificial Intelligence, Predictive Analytics, Smart Sensors, Real-Time Power Consumption, IoT, Energy Optimization.

Paper Id: A474

**Extraction, Phytochemical Analysis and Evaluation of
Gymnema Sylvester, Trigonella Foenum-Graecum,
Cinnamomum verum and Zingiber Officinale for
Antidaibetic Activity**

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ABSTRACT

Diabetes mellitus is a chronic metabolic disorder characterized by elevated blood glucose levels due to impaired insulin secretion or action. The increasing global prevalence of diabetes and its related complications has created a need for safer, effective, and affordable treatment options. Medicinal plants have been widely used in traditional systems of medicine for diabetes management because of their therapeutic potential and minimal side effects. The present study focuses on the extraction, phytochemical analysis, and evaluation of antidiabetic activity of Gudmar (*Gymnema sylvestre*), Fenugreek (*Trigonella foenum-graecum*), Cinnamon (*Cinnamomum verum*), and Ginger (*Zingiber officinale*), which are traditionally known for their antidiabetic properties. Aqueous and hydroalcoholic solvents were used to obtain maximum yield of bioactive constituents. Preliminary phytochemical screening was carried out to detect the presence of secondary metabolites. Qualitative estimation of total phenolic and flavonoid content was also performed using standard analytical methods. These tests were conducted to assess the role of the extracts in controlling carbohydrate metabolism and reducing oxidative stress. The study highlights a positive correlation between phytochemical content and antidiabetic activity, supporting the traditional use of these medicinal plants.

Keywords: Diabetes Mellitus, Herbal plant Extract, Phytochemical Analysis, Anti-Diabetic Activity.

PAPER ID : A475

DESIGNED BLUETOOTH STETHOSCOPE FOR HEART RATE MONITOR WITH OLED DISPLAY

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Abstract:

Cardiovascular diseases remain one of the leading causes of mortality worldwide, creating a strong demand for accurate, affordable, and portable heart monitoring systems. Conventional acoustic stethoscopes are limited to auditory assessment and do not provide digital measurement, storage, or real-time numerical display of heart rate to overcome these limitations, this project presents the design and development of a piezoelectric diaphragm-based digital stethoscope for heart rate monitoring using an ESP32 microcontroller and OLED display. The proposed system utilizes a piezoelectric diaphragm electrode to detect mechanical vibrations generated by heart sounds (S1 and S2). Based on the piezoelectric effect, these vibrations are converted into corresponding electrical signals. Since the raw signals are weak and susceptible to noise, appropriate signal conditioning techniques including amplification and filtering are employed to enhance signal quality. The conditioned signal is then processed by the ESP32 microcontroller, which performs analog-to-digital conversion, peak detection, and heart rate calculation in beats per minute (BPM). The calculated heart rate is displayed in real time on a compact OLED display, ensuring clear visualization with low power consumption. All components are integrated onto a custom-designed PCB to achieve compactness, reliability, and portability. The system is designed to be cost-effective and suitable for clinical, rural, and home healthcare applications. The developed device demonstrates an efficient approach to digital heart sound acquisition and real-time heart rate monitoring, contributing toward the advancement of smart and portable biomedical diagnostic systems.

Keywords: Smart Stethoscope, ESP32, Piezoelectric Sensor, Heart Sound Monitoring, OLED Display, Wireless Biomedical System.

Paper Id: A476

Determinants of Operational Efficiency in Indian Automobile Manufacturing Firms

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ABSTRACT

The Indian automobile manufacturing industry is one of the most capital-intensive sectors in the national economy, demanding continuous investment in plant, machinery, and production capacity. Despite significant capital deployment over the past decade, many listed manufacturers have not seen proportionate improvements in Return on Capital Employed (ROCE), revealing a persistent gap between investment scale and capital productivity. This study investigates the operational determinants of this gap among Indian automobile manufacturers listed on the Bombay Stock Exchange and National Stock Exchange for the period 2021 to 2025. A four-pillar operational efficiency framework is developed, comprising Cost Efficiency, Asset Utilisation, Working Capital Flow Efficiency, and Capacity Expansion Intensity, with ROCE as the primary dependent variable. Secondary data from published annual reports and the Capitaline financial database were used, covering fifteen purposively selected manufacturers and yielding 75 firm-year observations. Multiple linear regression and a Monte Carlo simulation were employed to identify significant operational drivers of ROCE and to model the range of capital return outcomes under varying operational conditions. The model demonstrated strong explanatory power with $R^2 = 0.82$, Adjusted $R^2 = 0.79$, and $F = 24.05$ ($p < 0.001$). Total Asset Turnover was the strongest positive predictor ($\beta = 7.539$, $p < 0.001$), followed by PBIDT Margin ($\beta = 0.6186$, $p = 0.0051$), confirming that asset productivity and operating profitability are the primary drivers of capital returns. The Cost-to-Net Sales ratio had the most significant negative effect ($\beta = -135.24$, $p = 0.0057$), establishing cost inefficiency as the leading constraint on ROCE. Capital expansion variables were statistically insignificant, indicating that capacity addition alone does not improve capital productivity. The Monte Carlo simulation returned a mean ROCE of 17.33%, ranging from -39.88% to +24.86%, underscoring the risk embedded in operationally weak configurations. Overall, the findings confirm that integrated operational discipline is a more reliable driver of capital productivity than investment scale, with practical implications for managers, investors, and policy-makers.

Keywords: Operational efficiency, ROCE, capital productivity, asset utilisation, cost efficiency, working capital management, panel data regression, Indian automobile manufacturing, Monte Carlo simulation.

Paper Id: A477

Development of an automatic salt detection and self cleaning drip irrigation system

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Abstract

Drip irrigation is an efficient method of water delivery in agriculture, but its performance is often affected by emitter clogging caused by salt and mineral deposition. The use of saline water for irrigation increases the risk of salt accumulation inside pipelines and emitters, leading to reduced flow rate and uneven water distribution. To overcome this problem, an automatic salt detection and self-cleaning drip irrigation system was developed. The proposed system uses a salinity sensor to continuously monitor the salt concentration in irrigation water. The sensor data is processed using an Arduino microcontroller, which acts as the control unit of the system. When the salt level exceeds a predefined threshold, the system automatically activates a relay module to initiate the flushing mechanism. A chemical injector is also used to supply a cleaning solution for effective removal of salt deposits from the irrigation lines. Experimental results show that the system performs effectively at an optimal flow rate of 0.2 L/s, with a chemical dosage of 0.05 L mixed in 10 L of water and a flushing time of 50 seconds. Under these conditions, the system achieved a maximum salt removal efficiency of approximately 90–95%. The automated cleaning process reduces manual labour, prevents emitter clogging, and improves irrigation efficiency. Thus, the developed system provides a reliable and cost-effective solution for maintaining drip irrigation systems under saline water conditions, ensuring uniform water distribution and improved agricultural productivity

Keywords: Automatic Salt Detection, Self-Cleaning Drip Irrigation, Salinity Sensor, Arduino Microcontroller, Flushing Mechanism.

Paper Id: A478

AI Driven Placement Strategy Engine For Decision Support In Campus Recruitment

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Abstract

Most universities are still using a traditional method to place students on campus that does not allow for successful data-driven decision-making since they continue to use static criteria and manually shortlist candidates. While machine learning has been used to predict placement outcomes in the past, the majority of the research that has been done has only been focused on predicting placement results after placements have occurred. The purpose of this paper is to propose a new technology called the AI-driven Placement Strategy Engine (AI PSE), which will be an intelligent decision support system that transforms the process of placing students into a structured and analytical process. This intelligent decision support system is comprised of 4 components: (i) a machine learning model to predict the probability of a student's placement, (ii) an optimization model used to match students with companies based upon a constrained assignment approach, (iii) an explainable recommendation engine with the purpose of identifying skill gaps and providing actionable recommendations, and (iv) a scenario-based "what-if" analysis module to assess strategy modification. In constructing the model, a combination of a student's academic performance, technical skill level, and actual experience will be evaluated. Results from the experiments support the AI PSE concept will help to (i) provide more accurate student placement outcomes; (ii) assist in better planning for future placements; and (iii) allow for scalable and interpretable data-driven decision-making.

Keywords: AI-Driven Placement, Machine Learning, Optimization, Explainable AI, Decision Support

PAPER ID: A479

DESIGN OF MEMBERS FOR SHEAR AND SIMPLE SHEAR CONNECTIONS

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ABSTRACT

Steel structures need members and connections to handle loads safely. This project is about designing steel members that can withstand shear forces and creating connections using Tekla Structures. We focus on steel elements like beams and columns designing them for specific loads using standard guidelines. We chose connections like fin plates end plates and angle cleats because they are easy to make and cost-effective. Tekla Structures is used to create a model of the structure and to design the connections carefully. The software helps us define the properties of the materials the parts of the connections the arrangement of bolts and the details of the welds. This ensures that the connections we design are safe and can be made easily. We check our designs to make sure the bolts, plates and welds can handle shear, bearing and block shear failures. Using Tekla Structures helps us see how the connections will behave reduces mistakes and improves communication between designers and makers. We can automatically generate drawings and lists of materials from the model, which saves time and reduces work. This project shows how tools like Tekla Structures can be used to design and detail shear connections effectively. This leads to efficient and construction-ready steel designs. The main things we looked at are Structural Steel Design, Shear Force, Simple Shear Connections, Fin Plate Connection, End Plate Connection, Bolt and Weld Design, Tekla Structures, BIM Modeling, Steel Detailing and Fabrication Drawings. Steel structures and Structural Steel Design are very important, in this project.

Keywords: Structural Steel Design, Shear Force, Simple Shear Connections, Fin Plate Connection, End Plate Connection, Bolt and Weld Design, Tekla Structures, BIM Modeling, Steel Detailing, Fabrication Drawings.

Paper Id: A480

IoT-Based Smart Home Automation System for Enhanced Security and Energy Efficiency

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Abstract

The Internet of Things (IoT) has emerged as a transformative technology enabling intelligent and interconnected environments, particularly in the domain of smart home automation. This paper presents an overview of IoT-based smart home systems that enhance convenience, security, and energy efficiency by integrating various devices and sensors through internet connectivity. Smart home automation utilizes embedded systems, wireless communication protocols, and cloud computing to monitor and control appliances such as lighting, heating, air conditioning, security cameras, and home entertainment systems. The proposed system leverages IoT architecture consisting of sensing, network, and application layers, where sensors collect real-time data and transmit it to cloud platforms for analysis and decision-making. Users can remotely access and manage their home devices via smartphones or web applications, ensuring flexibility and improved quality of life. Additionally, automation features such as scheduling and adaptive control contribute to energy conservation and cost reduction. Despite its advantages, IoT-based smart home systems face challenges including data security, privacy concerns, and interoperability issues among heterogeneous devices. This study highlights the importance of robust security mechanisms and standardization to ensure reliable and safe operation. Overall, IoT-driven smart home automation represents a significant advancement toward intelligent living spaces, offering enhanced comfort, efficiency, and sustainability.

Keywords: IoT, Smart Home Automation, ESP32, Sensors, Wireless Communication, Energy Efficiency, Home Security, Remote Monitoring.

Paper Id: A481

DESIGN OF A LOW PROFILE DUAL POLARIZATION WIDEBAND SEMI-FLEXIBLE ANTENNA

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Abstract

This research presents the design and numerical simulation of a low-profile, semi-flexible antenna developed for high-frequency millimeter wave applications. The antenna is designed and analyzed using CST Studio Suite 2021, employing a complex radiating geometry optimized for dual polarization.

This dual-polarization capability enhances signal diversity and improves data throughput in multipath propagation environments. The proposed design adopts a compact planar structure that maintains mechanical stability while providing the flexibility required for integration into conformal platforms such as wearable electronic devices and curved automotive surfaces. Simulation results demonstrate excellent performance characteristics around the 24 GHz frequency band.

Keywords: Millimeter Wave Applications, Dual Polarization, CST Studio, 24 GHz Frequency Band.

Paper Id: A482

Air Quality Index Mapping in Thiruvallur District

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Abstract

Air pollution has become a significant environmental issue in rapidly industrializing regions, affecting both human health and ecological balance. This study focuses on the assessment and mapping of the Air Quality Index (AQI) for Tiruvallur District, Tamil Nadu, using satellite-based datasets and geospatial techniques. The objective is to analyze the spatial and temporal variation of major air pollutants, namely particulate matter (PM_{2.5}), nitrogen dioxide (NO₂), and sulfur dioxide (SO₂), over a four-year period from 2019 to 2022. The datasets were obtained from the Sentinel-5P (TROPOMI) mission and the Global High Air Pollution (GHAP) dataset and processed using Google Earth Engine (GEE) and GIS tools. Pollutant concentrations were converted into uniform units (µg/m³) and categorized seasonally into pre-monsoon, monsoon, post-monsoon, and winter periods. The AQI was computed for each pollutant based on Central Pollution Control Board (CPCB) standards, and the maximum sub-index was considered as the final AQI for each location. Seasonal and multi-year AQI maps were generated to analyze pollution patterns and identify high concentration zones. The results indicate that AQI values are consistently higher during winter and post-monsoon seasons due to reduced atmospheric dispersion, while monsoon seasons show improved air quality due to rainfall-induced pollutant removal. High pollution zones were predominantly observed near industrial regions within the district. This study demonstrates the effectiveness of integrating remote sensing and GIS techniques for large-scale air quality monitoring and provides valuable insights for environmental planning and pollution management.

Keywords: Air Quality Index (AQI), Air Quality Mapping, Sentinel-5P, GIS, Remote Sensing, Spatio-temporal Analysis, Air Pollutants, Seasonal Mapping, Seasonal Analysis.

Paper Id: A483

Behavioral Analysis of Surveillance Video for Criminal Profiling Using Motion Features

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Abstract

The rapid growth of CCTV surveillance systems in urban and semi-urban areas has enhanced public safety; however, their effectiveness is limited due to reliance on manual monitoring. Human operators often miss critical events due to fatigue and attention lapses, highlighting the need for automated solutions. This paper proposes a machine learning-based framework for behavioral profiling from CCTV video using motion pattern analysis. Unlike traditional systems focused only on explicit violence detection, the proposed approach captures subtle motion dynamics associated with suspicious or pre-criminal activities, such as abrupt movements and irregular motion patterns. Surveillance footage is processed using OpenCV through frame extraction and frame differencing to quantify motion. From these representations, statistical features such as mean motion intensity, peak magnitude, and motion variance are computed. These features are used to train a Random Forest classifier to categorize activities into low-risk and high-risk profiles. The model improves detection reliability while maintaining computational efficiency, enabling scalable deployment. This behavior based approach enhances early warning capability and supports proactive crime prevention in surveillance systems.

Keywords: Criminal Profiling, Video Surveillance, Behavioral Analysis, Motion Detection, Random Forest, Anomaly Detection, Smart City Security.

Paper Id: A484

SehatTrix AI: An Intelligent Vision-Based Conversational Chatbot for Therapeutic Alliance

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Abstract:

With the advancements of large language models, artificial intelligence is being used more in healthcare by patients and doctors for better communication, basic medical advice and triage assistance. However, it is observed that even after these developments and improvements, many old and outdated healthcare chatbots still use simple keywords and fixed rule-based architectures. Because of this, they frequently give general answers and lack an understanding of what the user actually means. Also, most current systems can only read text communication and cannot analyse the images like burns, rashes, wounds or cuts which makes them less helpful in real-life medical situations. To overcome these limitations, a multimodal system ‘SehatTrix AI’ is developed. It is a smart multimodal system that can understand text message and analyse images together. The system uses ResNet to analyse images and applies an advanced image-processing to study medical images. BERT is used for language-understanding for user’s message and its context. Unlike regular chatbots that use only text, this method can take audio and image as input to give more accurate and medically useful responses. To make chatbot more useful and comfortable for users, SehatTrix includes both scientifically first-aid advice from modern medicine along with simple Ayurvedic home remedies. By combining different AI technologies into one multimodal system, it provides a more reliable alternative to traditional healthcare chatbots. This approach helps deliver accurate early health insights, improves the detection of common medical conditions, and offers personalized recommendations based on each user’s needs.

Keywords: Multimodal system, home remedies, chatbot, conversational framework, healthcare advice, transformers

Paper Id: A485

VoiceShield: Real-Time AI Voice Deepfake Detection and Fraud Alert System

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Abstract

The rapid advancement of artificial intelligence has enabled the creation of highly realistic synthetic voices, commonly known as audio deepfakes, which pose serious threats to security, privacy, and digital trust. This project presents a deep learning-based web application capable of detecting AI-generated voice recordings in real time. The system extracts Mel spectrograms from uploaded audio samples, converting the audio into visual representations of its frequency spectrum over time. These spectrograms are then analyzed and classified using a trained Convolutional Neural Network (CNN) to determine whether the voice is real or fake. The platform integrates a user-friendly frontend interface with a backend prediction engine to provide instant results along with confidence scores. Experimental evaluation demonstrates that the CNN model effectively distinguishes synthetic speech from genuine recordings, showing promising potential for cybersecurity, forensic analysis, and media authentication applications.

Keywords: Audio Deepfake Detection, Machine Learning, Speech Analysis, Mel Spectrogram Features, Voice Authentication, Cybersecurity, Digital Forensics, Audio Classification, Artificial Intelligence, Speech Processing.

Paper Id: A486

Drone-Based Thermal Imaging for Forest Fire Detection:

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Abstract:

Forest fires pose an escalating threat to global ecosystems, biodiversity, and human safety, necessitating rapid-response detection systems. This project proposes an autonomous Drone-based Thermal Imaging system designed for the early identification and real-time monitoring of wildfires. Traditional surveillance methods, such as satellite imagery or ground-based watchtowers, often struggle with low spatial resolution or visibility issues caused by dense smoke and rugged terrain. By deploying Unmanned Aerial Vehicles (UAVs) equipped with high-sensitivity Thermal Infrared (TIR) sensors, this system can pinpoint localized “hotspots” and heat signatures that remain invisible to conventional optical cameras. The methodology focuses on real-time data processing and autonomous flight path optimization to ensure maximum coverage with minimal latency. Experimental results demonstrate that thermal-equipped drones can effectively penetrate smoke screens to provide accurate heat maps, significantly reducing the time between ignition and emergency intervention. This project offers a scalable, cost-effective solution for proactive forest management, ultimately enhancing disaster mitigation strategies through advanced aerial intelligence. The core of this system lies in the seamless integration of Edge Computing and Artificial Intelligence (AI). Rather than simply streaming raw video—which can be slowed and bandwidth-heavy—the drone utilizes an on board microprocessor to run Convolutional Neural Networks (CNNs).

Keyword: Machine Learning, Drone flight, Artificial intelligence, CNN, edge computing.

Paper Id: A487

Darcy–Forchheimer MHD Slip Flow with Heat Source/Sink and Thermal Radiation over a Porous Shrinking Sheet Using the Keller Box Method

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Abstract

...This study investigates the behavior of Darcy–Forchheimer magnetohydrodynamic (MHD) slip flow with heat source/sink and thermal radiation over a porous shrinking sheet using the Keller box method. The governing nonlinear partial differential equations describing the flow and heat transfer are transformed into a system of coupled nonlinear ordinary differential equations through appropriate similarity transformations. The effects of key physical parameters, including the magnetic field parameter, Darcy permeability, Forchheimer inertia coefficient, velocity slip, heat generation/absorption and radiation parameter, are analyzed in detail. The numerical solutions are obtained using the implicit Keller box scheme, known for its stability and accuracy in boundary layer problems. The results show that increasing the Darcy–Forchheimer parameter over the shrinking surface reduces fluid velocity and temperature due to higher inertial resistance in the porous medium. Simultaneously, the concentration profile increases with higher Darcy–Forchheimer values ($Fr = 0.1, 1, 2, 3$) as suppressed fluid motion limits mass diffusion. These findings are particularly relevant for engineering applications such as polymer extrusion, cooling of porous materials, filtration systems, geothermal energy extraction and chemical processing, where control of flow, heat and mass transfer is critical.

Keywords: Darcy–Forchheimer porous medium, MHD (Magnetohydrodynamic) flow, Heat source/sink, Thermal radiation, Keller box method.

Paper Id : A488

A study on The Dynamics of Viral Market Rumours and Herd Behaviour Among Young Investors

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Abstract

The rapid proliferation of social media and digital communication platforms has significantly transformed the behaviour of young investors, particularly in the context of viral market rumours and herd dynamics. This study examines the influence of market rumours on investment decision-making among young investors, with a specific focus on behavioural patterns such as imitation, emotional responses, and risk perception. Primary data collected through structured questionnaires reveals that a majority of respondents, predominantly aged 20–24 with limited investment experience, are moderately influenced by market rumours. The findings indicate that emotions such as confusion, excitement, and fear play a crucial role in shaping investment actions, often leading to herd behaviour. While many participants prefer to verify information or adopt a wait-and-watch approach, a significant proportion admits to making investment decisions based on trends and peer influence. Social media platforms, including YouTube, Instagram, and messaging applications, emerge as key drivers of information dissemination. The study further highlights that financial literacy, research orientation, and expert advice can mitigate the adverse effects of rumours. Overall, the research underscores the need for enhanced investor awareness and education to promote rational decision-making and reduce susceptibility to irrational market behaviour.

Keywords :

Market Rumours, Herd Behaviour, Young Investors, Social Media Influence, Behavioural Finance, Investment Decision-Making

Paper Id: A489

NeuroFlow - AI Powered Learning Platform for Dyslexic & Autistic Students

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Abstract

NeuroFlow is an AI-powered adaptive learning platform designed to support neurodiverse students, particularly those with dyslexia and autism spectrum disorder (ASD). Traditional education systems often fail to address their unique cognitive needs, leading to reduced engagement and learning gaps. NeuroFlow provides curriculum-aligned content based on the CBSE framework (Grades 1–12) and integrates AI-driven features such as intelligent tutoring, text-to-speech, speech recognition, and visual learning assistance. The platform includes an adaptive learning engine that dynamically adjusts lesson difficulty and flow based on student performance. Additionally, real-time dashboards enable teachers and parents to track progress and provide personalized guidance. Built using modern web technologies, the system ensures scalability, usability, and seamless interaction. NeuroFlow offers an inclusive, efficient, and personalized solution to enhance learning outcomes and engagement for students with learning disabilities.

Keywords: Adaptive Learning, Dyslexia, Autism, Assistive Technology, Artificial Intelligence, Inclusive Education, Personalized Learning, Educational Technology.

PAPER ID: A490

ADAPTIVE TRAFFIC MANAGEMENT SYSTEM

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ABSTRACT

. Traffic congestion in urban areas is a significant problem caused by increasing vehicle density and inefficient signal control mechanisms. Traditional traffic signals operate on fixed time intervals, which often lead to unnecessary waiting time and poor traffic flow during low or high traffic conditions. This project presents an Adaptive Traffic Management System implemented using Java, designed to dynamically adjust traffic signal timing based on traffic density. The system simulates real-time traffic conditions using algorithm-based density generation and classifies traffic levels into low, medium, and high categories. Based on the detected density, the green signal duration is automatically calculated and adjusted to optimize traffic movement. This adaptive approach reduces congestion, minimizes idle waiting time, and improves overall road efficiency compared to conventional fixed-time traffic control systems. The system follows a modular architecture consisting of a user interface layer, adaptive logic engine, and optional database layer for logging traffic data. By eliminating the dependency on physical sensors, the proposed model provides a cost-effective and scalable software-based solution suitable for academic demonstration and further smart city research applications.

Keywords: Traffic Congestion, Dynamic Signal Control, Traffic Density Analysis, Intelligent Traffic, Smart City Applications

Paper Id: A491

Intelligent Rider Safety System Using Deep Learning and GSM

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Abstract

Deep Learning has emerged as a powerful technology in modern intelligent systems, enabling automated analysis and decision-making through advanced data processing techniques. With the rapid growth of smart transportation systems and increasing road accidents, there is a critical need for intelligent safety mechanisms to protect two-wheeler riders. This paper presents an *Intelligent Rider Safety System using Deep Learning and GSM*, designed to enhance road safety through real-time helmet detection and emergency alert generation. The system employs a Convolutional Neural Network (CNN) to verify visual data captured from a camera module and accurately determine helmet usage. Furthermore, the proposed system incorporates an accident detection mechanism by continuously monitoring system activity and identifying abnormal conditions such as camera failure or interruption. Upon detecting helmet violations or potential accident scenarios, the system activates a buzzer alert and utilizes GSM technology to send instant notifications and calls to predefined emergency contacts. This integration of deep learning and communication technologies ensures timely intervention and improved safety outcomes.

Keywords: Deep Learning, CNN, Helmet Detection, GSM, Road Safety, Accident Detection.

Paper Id: A492

Any Help: Development of an AI-Powered Web Platform for Personalized Support and Counseling Services

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ABSTRACT

Any Help.com is a web-based digital platform designed to provide personalized assistance across multiple aspects of daily life, including mental health, relationships, financial well-being, and personal development. In the modern digital era, individuals often struggle to find reliable guidance and professional support through scattered online resources. The proposed system addresses this challenge by integrating curated knowledge resources, intelligent automation, and professional consultation services within a single unified platform. The system incorporates an AI-powered chatbot that serves as the first point of interaction, enabling users to express their concerns and receive immediate guidance through Natural Language Processing (NLP). Based on user queries, the platform recommends relevant articles, research materials, and multimedia learning resources to enhance awareness and self-help capabilities. In addition, the platform allows users to book online appointments with certified therapists and counselors and supports secure digital payment processing for consultations. By combining AI-based interaction, cloud-based data management, and a scalable web architecture, the system creates an accessible, confidential, and efficient support ecosystem that bridges the gap between individuals seeking help and qualified professionals.

Keywords- AI Chatbot, NLP, Online Counseling, Appointment Scheduling, Secure Payment System.

Paper Id: A493

A Hybrid AI Pipeline for Detecting Adversarial Access and Generating Deceptive Document Ecosystems

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Abstract

IP refers to the collection of creative works, inventions, proprietary research, and confidential business knowledge that organizations rely on to preserve innovation and maintain competitive advantage. With the rise of large-scale automation and intelligent data-mining tools, cyber adversaries now target IP repositories using machine-driven classification, clustering, and topic-extraction pipelines capable of rapidly identifying high-value information. Traditional protection mechanisms such as encryption, firewalls, and role-based access control often fail against these automated attacks because they focus on perimeter security rather than disrupting the analytical processes used to infer sensitive content. To counter these emerging threats, this project introduces a deception-oriented IP protection framework that focuses on misleading automated document-analysis systems rather than solely blocking access. The framework begins by monitoring user activity logs through a Variational Autoencoder (VAE), which learns normal behavioral patterns and detects anomalous interactions indicative of adversarial exploration. Once suspicious access is identified, the system generates an alternative, modified document environment engineered to distort semantic understanding. This environment is produced using NLP-driven text preprocessing, TF-IDF-based feature extraction, K-Means clustering, and LDA topic modeling to ensure that automated tools receive misleading patterns, artificial topics, and altered keyword distributions. Manipulation operations such as keyword permutation, selective keyword removal, and topic substitution create document sets that appear plausible yet yield inaccurate analytical outcomes. By corrupting the information signals relied upon by automated classifiers while preserving secure access for legitimate users through an isolated enclave, the proposed approach prevents adversaries from accurately discovering or extracting sensitive IP during reconnaissance.

Keywords: Intellectual Property Protection, Deception-Based Security, Variational Autoencoder (VAE), Anomaly Detection, Natural Language Processing (NLP), TF-IDF, K-Means Clustering, Latent Dirichlet Allocation (LDA), Topic Modelling, Data Mining, Adversarial Defense, Information Obfuscation, Behavioural Analysis, Intrusion Detection, Secure Enclave.

Paper Id: A494

AI-Driven Smart Agriculture Trends for Rural Farmers: Opportunities, Challenges, and Future Directions

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Abstract

Agriculture continues to be the primary source of livelihood for a significant portion of the rural population, particularly in developing countries such as India. However, the sector is increasingly confronted with multifaceted challenges, including climate variability, water scarcity, soil degradation, pest infestations, and limited access to modern agricultural knowledge and infrastructure. In this context, the integration of Artificial Intelligence (AI) with smart agriculture has emerged as a transformative approach to enhance agricultural productivity, sustainability, and resilience. This research paper presents a comprehensive analysis of emerging trends in AI-driven smart agriculture and evaluates their applicability for rural farmers. The study explores key AI technologies such as machine learning, deep learning, Internet of Things (IoT), remote sensing, and data analytics, which collectively enable precision farming and data-driven decision-making. AI-powered systems facilitate real-time monitoring of crop health, soil conditions, and weather patterns, thereby assisting farmers in optimizing the use of resources such as water, fertilizers, and pesticides. Additionally, innovations such as drone-based imaging, automated irrigation systems, and mobile-based decision support tools are significantly improving farm management practices, especially in resource-constrained rural environments. Furthermore, the paper highlights the role of AI in critical agricultural functions, including crop yield prediction, disease detection, climate adaptation, and supply chain optimization. It also examines ongoing government initiatives and successful implementation models that aim to promote digital agriculture in rural regions. Despite the promising benefits, the adoption of AI technologies among rural farmers is hindered by several challenges, such as high implementation costs, lack of digital literacy, inadequate infrastructure, and limited access to reliable internet connectivity. The findings of this study indicate that AI-driven smart agriculture has the potential to revolutionize rural farming by increasing efficiency, reducing risks, and improving income levels. However, to ensure inclusive growth, it is essential to develop affordable, user-friendly, and region-specific AI solutions. The paper concludes by emphasizing the need for collaborative efforts among policymakers, researchers, and technology providers to bridge the digital divide and empower rural farmers through accessible and sustainable agricultural innovations.

Paper Id: A495

CFD ANALYSIS OF SHELL AND TUBE HEAT EXCHANGER

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Abstract

.... A Shell and Tube Heat Exchanger is one of the most commonly used heat transfer devices in various industrial applications such as power plants, chemical processing industries, and oil refineries. Its primary function is to transfer heat between two fluids while keeping them physically separated. The efficiency and performance of a shell and tube heat exchanger depend on several important parameters, including fluid flow pattern, temperature distribution, pressure drop, and overall heat transfer rate. In this project, a detailed Computational Fluid Dynamics (CFD) analysis is carried out to study the thermal and fluid flow behavior inside a shell and tube heat exchanger. CFD is a powerful simulation tool that allows for the visualization and analysis of complex flow and heat transfer processes without the need for extensive physical experimentation. A three-dimensional model of the heat exchanger is designed using suitable modeling software, and the simulation is performed by applying appropriate boundary conditions such as inlet temperature, flow velocity, and pressure.

Keywords: Shell and Tube Heat Exchanger, Computational Fluid Dynamics, Heat Transfer Analysis, Fluid Flow Behavior.

Paper Id: A496

The Role of Corporate Governance in ESG Performance: A Bibliometric Review

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Abstract

This paper explores how corporate governance mechanisms affect Environmental, Social, and Governance (ESG) performance through a thorough bibliometric analysis of the literature. The main objectives are to identify the intellectual structure, key research themes, and future directions in this dynamic discipline. The study comprises bibliometric analysis of 847 peer-reviewed papers, published between 2004 and 2025 and retrieved from Scopus and Web of Science. Performance analysis, science mapping, and network analysis through VOSviewer and Bibliometrix-R software were the main methods used for bibliometric techniques. In order to visualize research landscape, co-authorship analysis, citation analysis, co-citation analysis, and keyword co-occurrence analysis were used. The results identified three major streams of research: (1) the influence of board characteristics on ESG performance, (2) the impact of ownership structure on sustainability outcomes, and (3) governance mechanisms as moderators of the ESG-financial performance relationship. The trend of publications demonstrates a steep increase in numbers from 2018 onwards, with major inputs from the United States, United Kingdom, and China. The analysis of keywords reveals that there has been a move from governance description to governance causal mechanisms, board diversity, and ESG-related controversies. Only English language peer-reviewed journal articles from two databases are included in this study. Future studies might consider looking into the fresh issues like digital governance, greenwashing detection, and governance dynamics of emerging markets. This bibliometric review is the first that has concentrated on corporate governance-ESG link, and therefore it provides a systematic intellectual structure mapping of the field along with insights that can be implemented by researchers, practitioners, and policymakers.

Keywords: Corporate Governance, ESG Performance, Board Diversity, Sustainability, Bibliometric Analysis, VOSviewer

Paper Id: A497

Development Of Nanogel System For Drug Delivery In Cancer Cells

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Abstract

Cancer remains one of the greatest global challenges that is in current need for a more viable drug delivery system for improving drug targeting and reducing systemic toxicity. Nanogel based drug delivery systems have gained attention due to their biocompatibility, high drug loading capacity, and ability to respond to physiological stimuli. Nanogels are three-dimensional, nanoscale polymeric networks capable of absorbing large amounts of water while retaining structural stability, making them suitable carriers for controlled drug delivery. In this study, a biopolymer based nanogel system is proposed for the delivery of a plant derived bioactive compound intended for cancer treatment. The nanogel formulation is designed using a mild and scalable preparation approach to ensure safety, reproducibility, and sustainability. The developed nanogels are designed enabling enhanced drug release under acidic conditions resembling the tumor microenvironment. The formulations are planned to be evaluated for physicochemical properties and encapsulation efficiency. Several studies show that nanogel has enhanced stability and better sustainability in terms of drug delivery compared to other conventional systems. This study highlights the feasibility of polymer based nanogels as a promising platform for future cancer drug delivery applications.

Keywords: Nanogel, Drug delivery system, Plant derived bioactive compounds, Cancer therapy

Paper Id: A498

HealthSpectra: Design and Development of an Intelligent Healthcare Guidance System Using Symptom Analysis and Voice-Based Interaction

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Abstract

HealthSpectra is a healthcare assistance system, created with the aim of making the process of understanding health simpler. It provides a unified interface wherein the user can describe their symptoms, after which the system provides guidance on the possible course of action. It has a voice interaction facility wherein the user can describe their concerns, after which the system recommends the best type of doctor or specialist. The user can either continue the interaction or schedule a meeting, either online or physically. In addition, the system provides a report analysis facility wherein the user can understand the details of the medical reports more easily, as the system provides the details of the reports in a simpler manner. During the development of the system, handling the types of user inputs and maintaining the simplicity of the output were the main challenges. The system has the advantage of being simple, efficient, and easy to use. Thus, the system provides a simpler way of handling health-related concerns, thereby laying the groundwork for future developments.

Keywords: Healthcare System, Symptom Analysis, Voice Interaction, Doctor Recommendation, Report Analysis, Healthcare Assistance, Medical Decision Support

Paper Id: A499

TerraRover-X: Design and Fabrication of an Advanced Baja Off-Road Vehicle for Extreme Terrain Applications

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ABSTRACT

Off-road vehicles designed for harsh environments must combine structural strength, lightweight construction, and efficient power transmission. Baja vehicles represent a specialized category of single-seat off-road vehicles engineered to perform effectively under extreme terrain conditions such as sand, mud, rocks, and uneven landscapes. This study presents the design and fabrication of an advanced Baja vehicle named TerraRover-X, developed to enhance off-road performance, durability, and driver safety. The design process includes conceptual modeling, structural analysis, material selection, and fabrication techniques. Special emphasis is placed on chassis strength, suspension geometry, steering stability, and drivetrain efficiency. Computer-Aided Design (CAD) tools were utilized for modeling and Finite Element Analysis (FEA) was performed to evaluate structural integrity under dynamic loading conditions. The fabricated vehicle was tested under simulated off-road conditions to evaluate its maneuverability, stability, and mechanical reliability. The results demonstrate that the TerraRover-X design successfully balances structural rigidity and weight reduction while providing improved off-road capability. This project also highlights the importance of practical engineering knowledge in vehicle design and fabrication processes.

Paper Id: A500

IoT and Machine Learning Integration for Smart Agriculture: A Review of Predictive Frameworks for Crop Health Management

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Abstract

Agriculture today is under growing strain from climate change, erratic rainfall, soil degradation, water scarcity, and the rapid spread of crop diseases. Conventional farming practices, which rely heavily on manual observation and experience-based judgment, often fail to deliver the speed and accuracy needed for effective interventions. In response to these challenges, the integration of the Internet of Things (IoT) and Machine Learning (ML) has emerged as a powerful approach to building smarter, data-driven agricultural systems. This paper presents a comprehensive review of existing IoT-based predictive analytics frameworks developed for crop health management and resource optimization. It examines how real-time sensor data — encompassing soil moisture, temperature, humidity, and crop imagery — can be harnessed using ML models such as Partial Least Squares Regression (PLSR), Convolutional Neural Networks (CNN), and hybrid deep learning architectures. The study critically evaluates recent advances, compares model performance across various approaches, and identifies key challenges including data heterogeneity, energy efficiency, rural connectivity, and scalability. Furthermore, emerging trends such as edge computing, federated learning, renewable-powered IoT networks, and explainable AI are discussed as promising enablers of scalable and eco-friendly smart farming. Overall, the fusion of IoT sensing and machine learning analytics holds significant potential to transform traditional agriculture into a more efficient, sustainable, and resilient system capable of addressing the future demands of global food security.

Keywords: Internet of Things (IoT), Machine Learning (ML), Precision Agriculture, Predictive Analytics, Crop Disease Detection, Smart Irrigation, Sustainable Farming, Edge Computing, Hybrid Models, Resource Optimization.

Paper Id: A501

THERMIS: A Smart Weather Adaptive Survival Support System

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Abstract:

Prolonged exposure to extreme environmental conditions has significant implications for human health, especially in outdoor and occupational settings. This paper proposes THERMIS, a compact and cost-effective Internet of Things (IoT) technology-based system for real-time monitoring of both environmental and physiological parameters. The proposed system is developed using an ESP8266-based NodeMCU and includes sensors for measuring ambient temperature, atmospheric pressure, heart rate, and blood oxygen saturation (SpO₂), thus providing a comprehensive measurement for thermal health conditions. The extracted data is processed using machine learning-based techniques, specifically the K-Nearest Neighbours (KNN) algorithm, for classifying thermal conditions and assessing the user's health status. The processed data is then forwarded to a cloud platform for remote monitoring and visualization using a web-based interface. Furthermore, context-aware health advisories are also provided by the proposed system to enable users to manage possible thermal stress conditions.

The proposed system architecture is based on a layered architecture, including embedded sensing, edge processing, and cloud-based visualization. THERMIS is intended for efficient and scalable applications in occupational safety, elderly care, and outdoor health monitoring.

Keywords: Internet of Things, Health Monitoring, K-Nearest Neighbours, ESP8266, Thermal Stress, Physiological Sensors, Cloud IoT

Paper Id: A502

JANVIDHAAN : PEOPLE'S CONSTITUTION

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Abstract

JANVIDHAAN is a modern, citizen-focused web platform designed to promote constitutional literacy and civic awareness through interactive digital tools and engaging user experiences. Built with a contemporary tech stack—React, TypeScript, Vite, Tailwind CSS, and Supabase—the platform delivers a seamless learning environment where users can explore the Indian Constitution, fundamental rights, and democratic values in one unified space. The platform provides a wide array of modules, including Interactive Learning Sections, Gamified Quizzes, Spin-the-Wheel Activities, AI-powered Constitutional Chatbot, Case Study Explorer, and a Community Story Wall. These features empower citizens—especially students and first-time learners—to understand legal concepts and test their knowledge. Through a combination of immersive educational content, interactive games, and community-driven engagement, JANVIDHAAN bridges the gap between complex constitutional theory and practical civic understanding. Emphasizing both usability and inclusivity. Designed for scalability and meaningful engagement, JANVIDHAAN is more than a learning portal—it is a digital companion built to educate, empower, and inspire responsible citizenship.

Keywords: Digital Governance, Civic Engagement Platform, Community Interaction System, Modular Web Architecture, Participatory Framework.

Paper Id: A503

Design and Simulation of T-shape Antenna for Wireless Sensor Network

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Abstract

This work to design and simulation of a T-shaped microstrip antenna operating at 5.8 GHz for Wireless Sensor Network (WSN) applications in the ISM band. The T-shaped geometry is adopted to enhance impedance matching and bandwidth while maintaining a compact antenna size suitable for sensor nodes. The antenna is designed on a low-loss dielectric substrate using microstrip line feeding, and its dimensions are calculated based on fundamental antenna theory. Electromagnetic simulation is carried out to evaluate key performance parameters such as return loss, VSWR, gain, radiation pattern, and bandwidth at the target frequency. Simulation results show that the proposed T-shaped antenna resonates effectively at 5.8 GHz with return loss below -10 dB, indicating good impedance matching. The antenna exhibits stable radiation characteristics with moderate gain and acceptable bandwidth to support reliable short-range wireless communication in dense sensor deployments. The compact structure, low profile, and ease of make the antenna well suited for high-frequency WSN applications where reduced interference and higher data rates are required.

Keywords: T-shaped microstrip antenna, 5.8 GHz, ISM band, Wireless Sensor Network (WSN), impedance matching, return loss, VSWR, bandwidth enhancement, compact antenna

Paper Id: A504

HYBRID FEATURE AND DEEP LEARNING MODELS FOR BASAL CELL CARCINOMA IDENTIFICATION

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Abstract

Basal cell carcinoma (BCC), the most common skin cancer, requires early and accurate diagnosis to improve treatment outcomes. This study presents a hybrid computer-aided diagnostic approach that combines handcrafted features (color, texture, and shape) with deep features extracted using convolutional neural networks (CNNs) from dermoscopic images. By integrating clinically meaningful descriptors with high-level representations learned automatically by CNNs, the proposed framework leverages both domain knowledge and deep learning capabilities. The hybrid feature set is used to classify BCC against benign and other malignant lesions. Experimental results show that the hybrid model outperforms models based solely on handcrafted or deep features, achieving higher accuracy, sensitivity, and specificity. These findings demonstrate that combining traditional image analysis with deep learning enhances robustness, interpretability, and diagnostic reliability, making the framework a promising tool for clinical decision support in BCC identification.

Keywords: Basal Cell Carcinoma (BCC), Hybrid Feature Fusion, Convolutional Neural Networks (CNN), Dermoscopy, Automated Skin Lesion Classification

Paper Id: A505

An Intelligent IoT-Based Environmental Cleaning System

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Abstract

Water pollution has emerged as a significant environmental challenge due to the accumulation of plastic waste and floating debris in rivers and lakes. Conventional cleaning methods are inefficient, labor-intensive, and pose safety risks to workers. This paper presents the design and development of a wireless IoT-based river cleaning boat, an automated and eco-friendly solution for floating waste collection. The proposed system integrates embedded control using an Arduino platform, wireless communication, sensors, and a conveyor-based mechanism for efficient waste collection and storage. Additionally, solar energy is utilized to enhance sustainability and reduce dependency on external power sources. The system enables real-time monitoring and remote operation, improving overall efficiency and reducing human intervention. Experimental evaluation demonstrates effective waste collection, reliable operation, and improved performance compared to traditional methods. The proposed solution contributes to sustainable water management and supports smart city initiatives.

Keywords: Wireless river cleaning, Autonomous surface vehicle, Water pollution control, Floating waste collection, Arduino-based control system, IoT communication, Environmental sustainability

Paper ID- A506

Differential characterization of microbes contributing in the Natural Cleaning of Recalcitrant Plastic

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Abstract:

The chemically inert material Polystyrene (PS) is a kind of rigid plastic material made up of aromatic polymer of styrene. It contains only a carbon carbon backbone lacking any hydrolysable group. This distinguishable property makes them scarcely susceptible to degradation. The usage of plastic (especially polystyrene) is immensely threatening for mankind and ecosystem. The conventional process of degradation is not adequate for these styrene polymers. It was reported that evolving microbial system can utilize these inert substances as their carbon source. Genetically modified microbes can be used to eradicate the recalcitrant plastic contaminants from soil and water. It was observed in various research that differential population of microorganisms form consortium to make biofilm in the process of plastic degradation. In this study, we have isolated three different bacterial strains (from pond water) that form morphologically distinct colonies in various culture media. These bacterial strains can grow in the presence of polystyrene-material as their sole carbon source. Differential extent of PS beads and PS chips utilization were observed. Upto 80% weight loss of PS chips was observed in a bacterial culture. We are trying to study the specific characteristic features of them for example different enzyme production, antibiotic sensitivity and salt tolerance. Our data support the fact that the isolated bacteria are capable of degrading polystyrene and can be further used to mitigate the environmental plastic-pollution predicament.

Keywords: Polystyrene, Recalcitrant, plastic contaminants, Plastic degrading bacteria.

Paper Id: A507

Hybrid Optimized Fuzzy Logic Controller for standalone Photovoltaic Systems with Two-Stage Converter

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Abstract

Standalone solar PV systems have emerged as a potential alternatives to electricity problems in areas where a grid is unavailable. Obtaining full power from a photoelectric system, DC-DC inverter, DC-AC converter, and control system presents great difficulties when building these devices. A standalone two-stage approach is introduced in this work with a boost converter followed by an inverter and a battery with a bidirectional converter. In this paper, Hybrid optimization (Chaotic Hybrid Butterfly Optimization Algorithm with Particle Swarm Optimization) based fuzzy logic controller for standalone PV battery with two-stage converter. The power of PV systems may be decreased by the oscillation, random fluctuation, and slow speed of their power tracking. To tackle these issues, a novel Fuzzy logic with Particle Swarm Optimization technique is implemented to the MPPT controller under fast varying irradiance and PS conditions. A photovoltaic has a non-linear output and cannot generate maximum power automatically because it is influenced by solar radiation, temperature, and shadow. Photovoltaic require a tracking system to produce maximum power. The fuzzy logic controller (FLC) is proposed in this paper as a Maximum Power Point Tracking (MPPT) system to get maximum power from photovoltaic with changes in irradiation and temperature. Fuzzy logic naturally provides a superior controller for this type of nonlinear application. The new control strategy design was evaluated and validated using extensive MATLAB simulations under different scenarios, including load variations. The system output was evaluated using extensive MATLAB simulations.

Keywords: Photovoltaic (PV), Fuzzy Logic Controller (FLC), Maximum Power Point Tracking (MPPT), Particle Swarm Optimization (PSO), Two-Stage Converter, Renewable Energy, MATLAB Simulation.

Paper Id: A508

Factors Influencing Job Satisfaction in Service sector

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ABSTRACT

Job satisfaction is a crucial factor that influences employee performance, productivity, and organizational success, especially in the service sector where human interaction plays a significant role. This study aims to analyze the various factors affecting job satisfaction among employees in the service industry. Key factors such as salary and benefits, working conditions, job security, career growth opportunities, work-life balance, and organizational culture are examined in detail. The research highlights that fair compensation and supportive management significantly enhance employee satisfaction. Additionally, opportunities for professional development and a positive work environment contribute to higher motivation levels among employees. On the other hand, job stress, lack of recognition, and poor communication negatively impact job satisfaction. The findings suggest that organizations in the service sector must adopt effective human resource practices to improve employee satisfaction, which in turn leads to better customer service and organizational growth. This study provides valuable insights for managers and policy makers to design strategies that foster a satisfied and productive workforce.

Paper Id: A509

PSYCHOLOGICAL FACTORS INFLUENCING INVESTMENT DECISIONS OF MILLENNIALS IN INDIA

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Abstract

The increasing participation of millennials in the Indian stock market has drawn significant attention to the psychological factors shaping their investment decisions. Unlike traditional investors, millennials are more exposed to digital platforms, real-time information, and social media influences, which significantly affect their financial behavior. This study aims to examine the key psychological determinants influencing investment decisions among millennial investors in India, with a focus on behavioral biases such as overconfidence, herding behavior, loss aversion, and risk perception. The research adopts a quantitative approach, collecting primary data through structured questionnaires from millennial investors actively participating in equity markets. Statistical tools such as factor analysis and regression modeling are proposed to identify the relationship between psychological factors and investment decision-making. Additionally, demographic variables such as age, income, education, and investment experience are considered to assess their moderating effects on investor behavior. The findings suggest that overconfidence bias significantly influences millennials' trading frequency and risk-taking behavior, often leading to suboptimal investment outcomes. Herd behavior play a crucial role, particularly due to the growing impact of social media platforms and financial influencers, which drive collective decision-making rather than independent analysis. Loss aversion is expected to result in a reluctance to realize losses, thereby affecting portfolio performance and long-term returns. Furthermore, risk perception varies based on financial literacy levels, with more informed investors demonstrating better decision-making capabilities. The study also reveals that digital accessibility and ease of trading have amplified impulsive investment decisions among millennials, making psychological biases more pronounced. However, financial literacy acts as a mitigating factor, reducing the adverse effects of behavioral biases and promoting more rational investment strategies. The findings highlight the need for investor education programs and regulatory frameworks to guide millennial investors toward informed decision-making. To conclude, this study contributes to the growing field of behavioral finance by providing insights into the psychological dynamics of millennial investors in an emerging market context. It emphasizes the importance of understanding investor psychology for improving market efficiency and designing better financial products and advisory services.

Keywords: Investor Psychology, Millennials, Behavioral Finance, Overconfidence Bias, Herd Behavior, Loss Aversion, Risk Perception, Indian Stock Market, Financial Literacy

Paper Id: A510

ZiNUS – Illicit Content Detection using NLP and Computer Vision

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Abstract

The exponential growth of digital communication platforms has enabled billions of users to exchange text, images, and videos every second, but it has simultaneously amplified the spread of illicit and harmful content. This includes hate speech, cyberbullying, toxic language, graphic violence, explicit imagery, extremist propaganda, and content promoting weapons, drugs, or illegal activities. Traditional moderation methods such as keyword filtering, manual review, and rule-based systems are no longer sufficient due to the increasing volume, complexity, and multimodal nature of online content. To address these challenges, this study presents Content Guardian, an AI-driven hybrid framework that integrates advanced Natural Language Processing (NLP) and Computer Vision (CV) techniques for automated illicit content detection. The system employs the RoBERTa transformer model to perform deep semantic analysis of textual content and uses the Vision Transformer (ViT) architecture for detecting harmful elements within images and extracted video frames. A multimodal fusion mechanism combines results from both pipelines to enhance classification accuracy and contextual understanding. The platform also provides secure REST APIs with a usage-based billing system, enabling seamless integration into external applications and enterprise platforms. Experimental evaluation shows significant improvements in detection accuracy, low latency processing, and robustness across diverse content types. The proposed model demonstrates strong potential for real-time content moderation in social media, e-learning, corporate communication, and regulatory monitoring environments. Overall, this research contributes toward building safer digital ecosystems by reducing dependency on manual moderation and enabling intelligent, scalable, and automated detection of harmful online content.

Keywords: Content Moderation, AI-driven, 3. Multimodal Detection, Harmful Content, Natural Language Processing (NLP), Computer Vision (CV).

Paper Id: A511

CFD ANALYSIS OF PLATE HEAT EXCHANGER

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Abstract

.....Compact heat exchangers are most widely used for heat transfer applications in industries. Plate heat exchanger is one such compact heat exchanger, provides more area for heat transfer between two fluids in comparison with shell and tube heat exchanger. The present work deals with simulation of heat transfer data performed on plate type heat exchanger. The heat exchanger used for carrying out this work consists of thin metal welded plates of stainless steel with 1mm thickness; distance between two plates is 3mm, chevron angle 45° and counter flow arrangement. This consists of total 14 numbers of plates The inlet and outlet temperatures of cold and hot fluids are been observed and with that condition's performance evaluation is by CFD investigation done.

Keywords: Plate Heat Exchanger, Compact Heat Exchangers, CFD Analysis,

..... Heat Transfer Performance, Counter Flow Arrangement.

Paper Id: A512

Recent Advances in Pepper Leaf Disease Detection Using Machine Learning Techniques

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Abstract:

Pepper crops are highly susceptible to various leaf diseases that significantly affect crop yield, quality, and farmers' income. Early and accurate detection of these diseases is essential for effective crop management and sustainable agriculture. In recent years, machine learning and deep learning techniques have emerged as powerful tools for automated plant disease detection. This literature review analyses recent research works that focus on pepper leaf disease identification using computer vision, image processing, and artificial intelligence techniques. Various approaches such as Convolutional Neural Networks (CNN), transfer learning models including ResNet, MobileNet, and Inception architectures, as well as hybrid models combining CNN with optimization algorithms or LSTM networks, are examined. The reviewed studies also highlight the importance of preprocessing techniques such as image enhancement, segmentation, and feature extraction to improve classification accuracy. Several datasets, including PlantVillage and BellCrop, have been utilized to train and evaluate these models, achieving high accuracy levels often exceeding 90%. Advanced models like EfficientNet, Vision Transformers, and YOLO-based frameworks have further improved detection performance and enabled real-time disease monitoring. This review summarizes the methodologies, datasets, performance metrics, and key findings of recent research to provide a comprehensive understanding of current trends in pepper leaf disease detection. The study also identifies research gaps and suggests future directions for developing more robust, scalable, and field-deployable intelligent agricultural systems.

Key words: Pepper leaf disease detection, Machine learning, Deep learning, Convolutional Neural Networks (CNN), Image processing, Precision agriculture.

Paper Id: A513

Design and Implementation of a Biogas-Based Street Lighting System Using Household and Agricultural Waste

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Abstract

Biogas serves as an alternative energy source that can solve the problem of clean energy and environmental protection. Biogas is produced by anaerobic digestion of organic materials, such as farm waste and food waste, which is primarily composed of methane and carbon dioxide, offering a renewable alternative to fossil fuels. This work focuses on different biogas technologies for electricity production, such as internal combustion engines, Otto cycle engines, Stirling engines, and TEGs, which are investigated. All the existing systems have their own pros and cons, although the measure of effectiveness and scalability is often context-based. This technique can be used to provide electricity for rural and off-grid areas by means of quite efficient engines and Otto cycle machines worldwide. Stirling engines provide low noise and high overall thermal efficiency, but TEGs represent a simpler and cheaper solution with lower output. Performance tests indicate that when optimized for methane content, the biogas engine system can offer efficiency rates comparable to those of fossil-based engines, with 95% CH₄-fueled engines yielding approximately 25% efficiency. The systems generate roughly 5 kW for 8 hours a day at a 243 kWh/tonne of biomass utilization. Biogas is a sustainable power production, not only to reduce dependency on non-renewable energy sources, but also because of the organic fertilizers that are produced from digestate slurry.

Keywords: Biogas, Sustainable energy, Green energy, Renewable energy, TEG.

Paper Id: A514

Detection of Microplastics Using Magnetic Fe₃O₄ Nanoparticles with Magnetometer and AI-Based Mobile Application Using Random Forest Model

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Abstract

Microplastic contamination has become a significant global environmental concern due to its persistence, widespread distribution, and potential risks to both ecosystems and human health. This paper proposes an innovative and cost-effective method for detecting microplastics using magnetic Fe₃O₄ (iron oxide) nanoparticles combined with magnetometer sensing and an AI-based mobile application. A sensitive magnetometer is used to capture variations in magnetic signals resulting from the interaction between nanoparticles and microplastics. These signals are preprocessed and analyzed using a Random Forest machine learning model integrated into a mobile platform for real-time detection and classification. The model is trained on a diverse dataset containing magnetic response patterns corresponding to different types and concentrations of microplastics, ensuring high accuracy and robustness. Experimental validation demonstrates that the proposed system provides reliable detection with improved sensitivity compared to conventional methods such as microscopy and spectroscopy, while significantly reducing analysis time and cost. This interdisciplinary approach combining nanotechnology, magnetic sensing, and artificial intelligence offers a scalable and user-friendly solution for addressing microplastic pollution and supports the development of smart environmental monitoring systems.

Keywords —

Microplastics, Fe₃O₄ nanoparticles, Magnetometer, Random Forest, Machine Learning, Environmental Monitoring, Magnetic Detection, AI Mobile Application, Nanotechnology, Water Pollution Detection

Paper Id: A515

SUPPLY CHAIN VISIBILITY AND TRANSPARENCY AS STRATEGIC ENABLERS OF RESILIENCE

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Abstract

In an increasingly volatile and uncertain global business environment, supply chain resilience has emerged as a critical capability for organizations striving to maintain continuity and competitiveness. This study examines the role of supply chain visibility and transparency as strategic enablers of resilience, highlighting how access to accurate, timely, and shared information across supply chain networks enhances an organization's ability to anticipate, respond to, and recover from disruptions. Visibility refers to the extent to which firms can track and monitor supply chain activities in real time, while transparency relates to the openness and clarity of information shared among stakeholders. The research adopts a quantitative research design, with data collected from supply chain managers and professionals across manufacturing and logistics sectors. It analyzes the relationships between supply chain visibility, transparency, and resilience. Additionally, mediating variables such as information sharing, collaboration, and adaptive capability are incorporated to better understand the mechanisms through which visibility and transparency influence resilience. Organizational factors such as technological readiness and supply chain complexity are also considered as moderating variables. The results suggest that supply chain visibility significantly enhances resilience by enabling early detection of disruptions, improving coordination, and facilitating faster decision-making. Real-time data access allows firms to proactively manage risks, optimize inventory levels, and ensure continuity of operations. Similarly, supply chain transparency strengthens trust and collaboration among supply chain partners, leading to improved information flow and reduced uncertainty. Transparent practices are also likely to enhance accountability and reduce opportunistic behavior, thereby contributing to a more stable and resilient supply chain network. Furthermore, the findings indicate that the combined effect of visibility and transparency creates a synergistic impact on resilience, where firms with high levels of both capabilities demonstrate superior adaptability and recovery performance. The mediating role of collaboration and adaptive capability is expected to be significant, indicating that the benefits of visibility and transparency are realized through improved coordination and flexibility. However, the study also acknowledges potential challenges, including data integration issues, technological costs, and concerns related to data security and confidentiality. Despite these limitations, the findings emphasize that investments in digital technologies such as IoT, blockchain, and advanced analytics can significantly enhance supply chain visibility and transparency. This research contributes to the literature by establishing visibility and transparency as strategic resources that enable supply chain resilience and long-term organizational performance.

Keywords: supply chain visibility, supply chain transparency, supply chain resilience, information sharing, collaboration, adaptive capability, organizational performance.

Paper Id: A516

Empirical analysis of Clinical Data with AI: Artificial Intelligence and Machine Learning approaches to Mathematical series

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Abstract: Present research study investigates the integration of mathematical series with artificial intelligence (AI) to enhance the analysis of clinical data, particularly for heart failure predictions. This article also presents the empirical analysis of clinical data of patients collected from open source using Artificial Intelligence (AI), highlighting the importance of AI and machine learning approaches to mathematical series in providing effective solutions in various medical fields. By applying machine learning models such as logistic regression and random forest alongside activation functions like ReLU, the present research identifies key risk factors, including serum creatinine, ejection fraction, and age. The present mathematical models achieved over 85% accuracy, demonstrating their potential for clinical prognosis of heart failure. Mathematical operations like gradient descent and matrix multiplication enabled efficient neural computation, mirroring cognitive processes. By emulating human neural processes through computational models, this research bridges the gap between abstract mathematical theory and its practical application in clinical diagnostics. This paper presents the convergence of AI and mathematical modelling, supported by analytical visualizations such as box plots, scatter plots, and heat maps. However, for AI systems to be viable in real-world medical settings, challenges such as data quality, interpretability, and scalability has been addressed.

Keywords: Artificial intelligence, Machine learning, Mathematical Series, Neural Networks, Logistic Regression.

Paper Id: A517

AI MALWARE USING MACHINE LEARNING AND BEHAVIOUR ANALYSIS WITH GMAIL INTEGRATION

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Abstract

Email communication remains one of the most widely used digital services globally, with Gmail alone processing billions of messages daily. However, this widespread usage has made email platforms a primary target for cybercriminals seeking to distribute malware and launch phishing attacks. Traditional signature-based antivirus solutions struggle to detect zero-day attacks and polymorphic malware that constantly evolve to bypass conventional security measures. The AI Malware Detector Using Machine Learning and Behavior Analysis with Gmail Integration addresses this security gap by introducing an intelligent, multi-layered detection framework that combines static Machine Learning classification with dynamic behavioral analysis. The system integrates with Gmail through the official Google Gmail API using OAuth 2.0 authentication to securely access email content and attachments. Upon connection, the system extracts comprehensive feature sets from both email metadata and attachment characteristics. These features are processed through an ensemble of four Machine Learning algorithms: Support Vector Machine (SVM), Logistic Regression, Random Forest, and XGBoost. The ensemble voting mechanism combines predictions from all four algorithms, significantly improving detection accuracy while reducing false positive rates. For attachments that receive suspicious classifications, the system employs an isolated sandbox environment for behavioral analysis. Suspicious files are executed safely within a virtual machine where runtime activities including file system modifications, registry changes, and network connections are monitored. This behavioral confirmation catches evasive malware that appears benign during static analysis.

Keywords: Artificial Intelligence, Machine Learning, Malware Detection, Behaviour Analysis, Gmail API, Sandbox Analysis, Ensemble Learning, Support Vector Machine, Random Forest, XGBoost, Logistic Regression.

Paper Id: A518

Robust Battery State Estimation and Anomaly Detection in Electric Vehicles Using Hybrid Techniques

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ABSTRACT:

Battery Management Systems (BMS) are essential for monitoring and controlling electric vehicle (EV) batteries by estimating important parameters such as State of Charge (SOC), State of Health (SOH) and State of Power (SOP). Traditional model based methods like Kalman filters are reliable but often struggle with nonlinear behavior, battery aging and changing environmental conditions. On the other hand, machine learning (ML) methods can improve accuracy but may lack consistency and robustness when used alone. This work proposes a hybrid estimation framework that combines model based observers with ML techniques to improve overall performance and reliability. The approach uses observer based residuals along with ML models to detect anomalies and possible cyber attacks in battery data. A dual Unscented Kalman Filter (UKF) is used for better SOH estimation and a temperature estimation method is included to monitor battery conditions and help prevent thermal issues during fast charging. The proposed system is tested on Lithium Iron Phosphate (LFP) battery models under different conditions including aging, temperature variations and simulated cyber attacks using MATLAB/Simulink simulations. The results show that combining model based and data driven methods can provide more accurate and robust battery state estimation for EV applications.

KEYWORDS:

Battery Management System (BMS), State of Charge (SOC), State of Health (SOH), Machine Learning (ML), Cyber Security

Paper Id: A519

Internet of Things (IOT) For Smart Cities

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Abstract

In present study, rapid increase in urban population has created many challenges in managing city infrastructure and daily services. It is observed that traditional systems are not sufficient to handle such complex urban needs. Because of this, concept of smart city is getting more attention in recent years. Internet of Things (IoT) plays important role in this area. It connects different devices, sensors and systems so that real-time data can be collected and used. Through this, decision making becomes faster and more efficient. In many cases, it also helps in reducing wastage of resources. In this work, different applications of IoT in smart cities has been discussed. It includes transportation systems, energy usage, waste handling, healthcare services and environmental monitoring. It is found that use of IoT improves overall performance of these systems and makes city operations more reliable. Further, integration of sensor networks with communication technologies and cloud platforms has been explained. However, some limitations are also there. Issues like data security, privacy problems, high cost and scalability need proper attention. Overall, it can be said that IoT has strong potential to change traditional cities into more efficient and sustainable systems. Future developments in this field may further improve quality of life in urban areas.

Keywords: Internet of Things (IoT); Smart Cities; Sensor Networks; Urban Infrastructure; Data Analysis; Energy Management; Sustainable Development; Cloud Computing

PAPER ID: A520

Autonomous Ethical Cognition Engine (AECE): A Self-Evolving Moral Intelligence Layer for Autonomous Systems

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ABSTRACT

The rapid growth of Artificial Intelligence (AI) has enabled the use of autonomous systems in critical areas such as healthcare, finance, defense, and governance. Although these systems demonstrate strong computational abilities, they lack context-aware ethical reasoning, making them unreliable in complex moral situations. Current AI models depend on fixed rules, predefined goals, or biased data, which are insufficient to handle dynamic ethical challenges involving diverse human values and uncertain outcomes. To address this issue, this project proposes an Autonomous Ethical Cognition Engine (AECE)—a self-evolving moral intelligence layer that integrates with existing AI systems. AECE combines multiple ethical frameworks, including utilitarianism, deontology, and virtue ethics, to support real-time ethical decision-making. It also includes an ethical simulation module to evaluate possible consequences and an explainable reasoning component that provides transparent justifications for decisions. Additionally, AECE features continuous learning through feedback loops, allowing it to adapt to changing societal norms and cultural contexts. By bridging the gap between machine intelligence and human values, this system aims to improve trust, safety, and fairness in autonomous technologies, paving the way for responsible and ethically aligned AI systems.

Keywords: Ethical AI, Autonomous Systems, Moral Reasoning, Utilitarianism, Deontology, Virtue Ethics, Explainable AI, Responsible AI, Machine Ethics, Continuous Learning

Paper Id-A521

AN EXPLAINABLE ADAPTIVE MULTI-MODAL LEARNING FRAMEWORK FOR STUDENT PLACEMENT PREDICTION WITH PERSONALIZED EMPLOYABILITY AND SKILL GAP INSIGHTS

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Abstract

Objectives for higher educational institutions. Traditional placement prediction systems primarily rely on limited academic data and often fail to capture the multi-dimensional factors influencing employability. To address these limitations, this paper proposes an Explainable Adaptive Multi-Modal Learning framework for intelligent student placement prediction and skill gap analytics. The proposed system integrates heterogeneous data sources, including academic performance, behavioral attributes, and resume-based textual information, to build a comprehensive student profile. An adaptive learning mechanism is employed to dynamically adjust feature importance and model parameters based on data characteristics, thereby improving prediction robustness. Multi-modal data fusion techniques are utilized to effectively combine structured and unstructured data, enabling more accurate and context-aware predictions. In addition to prediction, the framework incorporates explainable artificial intelligence techniques to provide transparent and interpretable insights into the decision-making process. This helps identify critical factors influencing placement outcomes and enhances trust in the model. Furthermore, a skill gap analysis module is integrated to detect discrepancies between student competencies and industry requirements, enabling personalized recommendations for improvement. Experimental evaluation on real-time or benchmark educational datasets demonstrates that the proposed approach outperforms traditional machine learning models, achieving an expected prediction accuracy in the range of 88%–92%. The system not only predicts placement outcomes but also supports data-driven decision-making for students and institutions by offering actionable employability insights.

Paper Id :A522

AI-Driven Campus Helpdesk Ticket Prioritization and Routing System

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Abstract

Higher education institutions regularly receive numerous service requests from students related to academic issues, infrastructure problems, technical support, hostel facilities, and administrative services. When these requests are handled through unstructured channels such as emails or direct office visits, institutions often face challenges such as delayed responses, lack of proper tracking, and limited communication transparency. To overcome these issues, this project proposes an AI-Driven Campus Helpdesk Ticket Prioritization and Routing System, a centralized web-based platform designed to manage student service requests efficiently through a structured ticketing workflow. The system enables students to submit complaints as support tickets and track their progress until resolution. It incorporates AI-based techniques for automatic ticket categorization, priority prediction, and routing to the appropriate department, ensuring faster and more accurate issue handling. Support staff can manage tickets by updating status and communicating with users, while administrators oversee system operations and user roles. The application is developed using Flask, SQLite, and web technologies, with features such as RBAC, secure authentication, file attachments, and audit logging, improving efficiency, transparency, and accountability.

Keywords— AI-Based Helpdesk System, Ticket Prioritization, Automatic Ticket Routing, Ticket Management System, Role-Based Access Control (RBAC), Flask Web Application, Student Support Services.

Paper Id: A523

A Multimodal AI-Based Decision Support Framework for Early Tuberculosis Risk Assessment in Rural Healthcare

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Abstract

Tuberculosis (TB) remains a major infectious disease, particularly affecting rural and low-resource populations where early diagnosis is often delayed due to limited diagnostic infrastructure and specialist availability. This study proposes a multimodal AI-based clinical decision support system for early TB risk assessment. The framework integrates chest X-ray images and structured clinical data such as symptoms and basic vital signs. A ResNet-50 convolutional neural network extracts radiographic features, while a multi-layer perceptron (MLP) processes clinical inputs, and both are fused for TB risk classification. Experimental results show that the multimodal approach achieves 91.8% accuracy, 0.90 F1-score, and 0.94 ROC-AUC, outperforming image-only and clinical-only models. The system is designed for mobile-assisted deployment in rural healthcare settings, supporting frontline healthcare workers in early TB screening and decision making.

Keywords: Tuberculosis; Multimodal Learning; Clinical Decision Support; Chest X-ray; Artificial Intelligence; Rural Healthcare

Paper Id: A524

Portfolio Risk Modeling Using Return Forecasting, Monte Carlo Simulation, and Tail-Risk Metrics

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Abstract

Traditional methods of risk management by invariable Gaussian statistical distribution or non dynamic volatility methods have been proved unsuccessful during times of marketplace strain, as observed during the Value at Risk failures of 2009 or the technology sector decline of 2023. In this work, a seven-layered machine learning pipeline for portfolio downside risk management, incorporating the successive consolidation of multi-source information intake from Yahoo Finance, News API or FRED; news sentiment investigation and by making use of FinBERT; based on return forecasters; Intense Value Theory-based tail risk carry out scheme learning through Diebold-Yilmaz variant vector decomposition; Markov Model regime detection based on Conventional Graph Attention Network incidental to inter-asset dependance learning; ensemble learning of LSTM, Transformer, and XGBoost-baation via neural copula-based joint scenario generation; four-dimensional tail risk measurement, including base CVaR, sentiment-based CVaR, regime-based CVaR, and causal stress VaR; and CVaR-based reinforcement learning. In the research project, employ the planned pipeline to a five-asset NASDAQ-based portfolio from 2019 to 2022, including the test period of the adversarial 2022 bear market. It has been predicted the supporting players forecast accuracy of 2.61% mean forecast MAPE, the pipeline risk management effectiveness of reduction Basel III backtesting exceeding from 19 to 4, and the reinforcement learning-based portfolio optimization Sharpe ratio of 0.61 with a supreme drawdown of 18.4%, which is 42% lesser than the equal-weighted arrangement . Also present the potency of each single layer of the pipeline via cutting out studies. In addition, employed causal strain investigation, which show a 38% danger estimation of the 200 basic points rate shock, which cannot be noticed through customary risk governance methods

Keywords: Portfolio Risk, LSTM, Transformer, XGBoost, FinBERT, Sentiment Analysis, Hidden Markov Model, Temporal Graph Attention Network, Monte Carlo Simulation, Extreme Value Theory, Neural Copula, Value-at-Risk, CVaR, Expected Shortfall, Reinforcement Learning, Causal Inference, DieboldYilmaz, Basel III, Backtesting.

Paper Id: A525

Optimized EV Charging Station Placement Using Hybrid Forecasting Techniques

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Abstract

Electric vehicles (EVs) are becoming more popular because they are environmentally friendly, but they can create challenges for power distribution systems. If EV charging stations are not placed properly, they can increase power losses and cause voltage problems. This system proposes a smart two-step method to decide the best locations for EV charging stations. First, a combined prediction model is used to estimate EV charging demand by analyzing both short-term changes and long-term patterns. Then, an advanced optimization technique is applied to find the best placement of charging stations while reducing power losses and maintaining stable voltage levels. The proposed method is tested on standard power system models using simulation tools and shows better results compared to traditional methods. This work highlights the importance of accurate demand prediction and proper planning for improving power system performance with increasing EV usage.

Keywords: Electric Vehicle, Optimization Technique, Forecasting Technique, Charging Station.

Paper Id: A526

ENHANCING CUSTOMER EXPERIENCE THROUGH PERSONALIZED SKILL DEVELOPMENT OF LAST-MILE LOGISTICS PERSONNEL IN E-COMMERCE

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Abstract

In the contemporary e-commerce ecosystem, customer experience has emerged as a critical source of competitive advantage, particularly within last-mile logistics where service delivery directly interfaces with end consumers. Despite rapid technological advancements in logistics operations, inconsistencies in service quality persist, largely attributable to variations in the competencies of frontline delivery personnel. Addressing this gap, the present study investigates the role of personalized skill development in enhancing customer experience through improved service delivery in last-mile logistics. Grounded in service quality and human capital development perspectives, the study conceptualizes personalized skill development as structured, role-specific training tailored to individual performance needs and operational contexts. A quantitative research design was employed, with primary data collected from e-commerce customers using structured survey instruments. The study examines key dimensions of skill development, including communication effectiveness, customer orientation, problem-solving capability, adaptability, and digital proficiency and evaluates their impact on customer experience, measured through perceived service quality, reliability, responsiveness, and overall satisfaction. The empirical findings demonstrate a robust and statistically significant relationship between personalized skill development and customer experience. Notably, communication effectiveness and customer-oriented behaviour emerged as the most influential predictors, significantly enhancing customer satisfaction and perceived service professionalism. Furthermore, digital skill enhancement was found to play a pivotal role in improving service transparency and operational accuracy. Personnel trained in the use of real-time tracking systems and mobile delivery applications were appreciated on account of being better equipped to provide timely updates, minimize delivery errors, and ensure adherence to delivery schedules. These improvements contributed to higher levels of customer trust and perceived reliability. The analysis also indicates that service quality functions as a significant mediating variable, reinforcing the pathway through which personalized training influences customer experience. Enhanced employee competencies translate into superior service interactions, thereby fostering positive customer perceptions and increasing the likelihood of repeat patronage. The study concludes that personalized skill development represents a strategic investment in strengthening the human interface of logistics operations. It recommends that e-commerce and logistics firms institutionalize continuous, data-driven training frameworks to align employee capabilities with evolving customer expectations. Such initiatives are essential for delivering consistent, high-quality service experiences and sustaining competitive advantage in an increasingly dynamic marketplace.

Keywords: Personalized skill development, last-mile logistics, customer experience, service quality, e-commerce, employee training, customer satisfaction, human capital development, logistics performance.

Paper Id: A527

IMPACT OF FINANCIAL TECHNOLOGY (FINTECH) ON CUSTOMER SATISFACTION

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Abstract

The rapid growth of Financial Technology (FinTech) has significantly transformed the delivery of financial services across the globe, particularly in emerging economies like India. FinTech platforms such as mobile banking, digital wallets, and online investment applications have enhanced accessibility, convenience, and efficiency for users. This study aims to examine the impact of FinTech services on customer satisfaction, with a focus on key dimensions such as ease of use, security, service quality, and reliability. The research adopts a quantitative approach using primary data collected through a structured questionnaire distributed among FinTech users. Respondents include individuals who actively use digital payment platforms such as Google Pay, PhonePe, and Paytm. The study employs statistical tools such as correlation and regression analysis to understand the relationship between FinTech services attributes and customer satisfaction. The findings reveal that ease of use and convenience are the most influential factors driving customer satisfaction. Users prefer FinTech services due to their time-saving nature, 24/7 accessibility, and seamless transaction processes. Security and privacy also play a critical role, as customers are highly sensitive to data protection and fraud risks. Additionally, service quality—measured in terms of transaction speed, app performance, and responsiveness—positively impacts user satisfaction. The results further indicate that while most users are satisfied with FinTech services, concerns regarding cybersecurity and technical glitches remain significant barriers to complete trust. Regression analysis confirms that all selected variables ease of use, security, reliability, and service quality have a statistically significant positive impact on customer satisfaction. This study contributes to the growing body of literature on digital finance by highlighting the importance of customer-centric FinTech design. The findings suggest that service providers should focus on enhancing security features, improving user interface design, and ensuring consistent service performance to increase customer satisfaction. Policymakers and financial institutions can also use these insights to promote safe and inclusive digital financial ecosystems.

Keywords: Financial technology (FinTech), customer satisfaction, digital payments, service quality, user experience and security and privacy

Paper ID : A528

MICROGRID BATTERY CHARGING MANAGEMENT USING ANN BASED....DC-DC CHARGE CONTROLLER

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ABSTRACT

This project presents an Artificial Neural Network (ANN)-based charging and discharging control technique for lithium-ion battery storage in microgrid applications. The proposed methodology takes into account available power, load demand, and the battery state-of-charge (SOC) to ensure the battery operates within a safe operating range. Unlike traditional control methods that face challenges such as overcharging, over discharging, and the complexity of control, the ANN-based approach offers a robust and adaptive solution. By training the neural network to predict optimal charging and discharging actions based on real-time system inputs, the controller effectively manages the battery's SOC, eliminating the need for extra sensing components or extensive mathematical calculations. Numerical simulations were conducted to evaluate the controller's performance under varying load conditions and power generation scenarios. The results demonstrate the effectiveness of the ANN controller in maintaining the SOC within a safe range (20% to 80%) and optimizing the battery's charging and discharging cycles. The model's efficiency and real-time applicability are confirmed through experimental results, showing that the developed ANN-based controller can manage the battery storage system effectively while reducing computational complexity. The primary contribution of this research is the development and implementation of an ANN-based control strategy for real-time charging and discharging management in microgrid applications, offering a simpler and more efficient alternative to traditional methods.

Keywords: Artificial Neural Network (ANN), Lithium-Ion Battery, Microgrid Systems, State of Charge (SOC), Battery Management System (BMS), Charging and Discharging Control, Renewable Energy Integration, Smart Grid, Energy Optimization, Real-Time Control, Load Demand Management, Power System Stability.

Paper Id: A529

Algorithmic Labour, Informalization and Social Protection Gaps: Rethinking Worker's Rights in the Gig Economy

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Abstract

The gig economy has experienced fast growth because platform-based systems with their algorithmic workforce management provide workers with flexible work options which create unsafe working conditions. This study investigates how organizations use algorithmic management systems to change work relationships while driving workers toward informal employment which prevents them from accessing basic social protections. The research uses a secondary data analysis approach to study Indian and other similar jurisdictions through government documents and international regulations together with policy frameworks and new research about platform employment and labour rules and social welfare programs. The research first explains the main ideas of algorithmic labour together with informalization and social protection before showing how rating systems and dynamic pricing and non-transparent task distribution and company-controlled worker deactivation methods create dangers that impact employees who do not meet traditional work frameworks or social security requirements. The study demonstrates that although gig and platform workers receive legal recognition, they face substantial challenges in accessing portable and sufficient benefits which remain difficult to obtain. The study concentrates on three main areas of vulnerability which include income instability and occupational safety and gender-specific hazards and the inability to express grievances. The paper argues that social protection gaps in the gig economy need resolution through hybrid regulatory models which require employers to pay into statutory social security funds and platform co-contributions while adhering to data governance and transparency rules and supporting worker collectives. The paper develops a new framework for understanding workers' rights in algorithmically controlled Labor markets by integrating diverse discussions from labour law social policy and digital governance into one comprehensive approach.

Keywords: Algorithmic labour, Gig economy, Informalization of work, Social protection gaps, Platform work, Labour rights

Paper Id: A530

A STUDY ON PERFORMANCE OF INDEX INVESTMENT AND RULE BASED TRADING MODEL IN INDIAN STOCK MARKET

Abstract

Financial markets have undergone a massive transformation in the last few decades due to the integration of technology, data analytics, and computational power. Earlier, trading decisions were primarily based on human judgment, gut feelings, and technical chart patterns. While this discretionary trading gave room for flexibility, it also exposed traders to emotional biases, inconsistency, and inefficiency. The emergence of systematic trading using quantitative models has changed this landscape. Systematic trading involves the use of rules-based models that analyze financial data and generate buy/sell signals. These models are rooted in mathematics, statistics, probability, and econometrics. Instead of intuition, decisions are made based on data-driven algorithms, making the process more consistent, disciplined, and backtestable. Quantitative models are widely used in hedge funds, investment banks, algorithmic trading firms, and even by retail traders. They help traders identify patterns, trends, correlations, and anomalies in price movements. With the availability of big data and machine learning, quantitative trading is not only limited to moving averages or regression models but also extends to neural networks, reinforcement learning, and predictive analytics.

The project “Systematic Trading Using Quantitative Model” focuses on developing a structured, rule-based framework for trading. The study aims to demonstrate how quantitative models can:

Paper Id: A531

Context-Aware Character and Mindset Identification Using Human Gesture

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Abstract

Artificial Intelligence (AI) has significantly advanced the way human behaviour can be analyzed and interpreted. This project proposes a context-aware system for analysing human character and mindset using facial expressions and body gestures as primary behavioural indicators. The system integrates Computer Vision, Pose Estimation, and Machine Learning techniques to capture and process real-time video input for continuous monitoring and analysis. The proposed system extracts facial landmarks such as eyes, eyebrows, nose, and mouth, along with body posture features including key joint positions. These features are used to identify emotional expressions and behavioural patterns such as confidence, stress, engagement, and hesitation. Unlike traditional systems that focus only on facial emotion recognition or speech signals, this approach introduces context awareness to improve interpretation accuracy and reduce gesture misinterpretation. A multi-modal analysis framework is implemented to combine facial and gesture-based inputs, enhancing prediction reliability. Machine Learning models are used to classify human mindset and behavioural traits based on extracted features. The system supports real-time processing and provides results through an interactive display interface. This approach improves human-computer interaction by enabling intelligent behavioural prediction and decision-making. The proposed system can be applied in various domains such as education, surveillance, smart environments, and assistive technologies. Overall, the project demonstrates an effective and scalable solution for advanced human-centric AI systems with improved accuracy and adaptability.

Keywords: Artificial Intelligence, Computer Vision, Pose Estimation, Facial Expression Analysis, Gesture Recognition, Machine Learning, Context Awareness, Behaviour Analysis, Human-Computer Interaction

Paper Id: A532

Solve Congestion Problem in Air Traffic Control

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(AFFILIATED TO A.K.T.U. LUCKNOW U.P.)

Abstract

The rapid growth of global air transportation has led to significant congestion challenges in air traffic control (ATC), resulting in increased delays, higher fuel consumption, and reduced operational efficiency. This research paper addresses the problem of air traffic congestion by proposing a systematic and mathematically grounded approach to optimize airspace utilization and traffic flow management. The study investigates the underlying causes of congestion, including limited airspace capacity, inefficient routing, and unpredictable factors such as weather and demand fluctuations. To mitigate these issues, the paper employs advanced mathematical techniques such as optimization models, queuing theory, and network flow analysis to develop efficient scheduling and routing strategies. A dynamic traffic management model is introduced to balance demand and capacity in real time, enabling improved coordination between aircraft and control systems. Additionally, simulation-based analysis is conducted to evaluate the performance of the proposed methods under varying traffic conditions. The results indicate that the application of mathematical modelling and intelligent optimization significantly reduces congestion levels, minimizes delays, and enhances overall system reliability. This research highlights the potential of integrating mathematical frameworks with modern ATC technologies to create more resilient and efficient air traffic management systems. The proposed approach offers valuable insights for aviation authorities and policymakers aiming to address congestion challenges in increasingly busy airspace environments.

Paper Id: A533

**A STUDY ON IMPACT OF UPI-LINKED GST
COLLECTIONS ON PERFORMANCE OF SMALL
BUSINESS AT COIMBATORE**

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Technology, Coimbatore, Tamil Nadu*

ABSTRACT

The rapid growth of digital financial technologies has significantly transformed business transactions and tax compliance systems in India. One of the most notable developments is the integration of the Unified Payments Interface (UPI) with the Goods and Services Tax (GST) framework, which has enhanced transparency and digital record-keeping in business operations. This study titled “A Study on Impact of UPI-Linked GST Collections on Performance of Small Businesses at Coimbatore” examines how the linkage between UPI transactions and GST collections influences the performance of small enterprises. The research focuses on key factors such as awareness and digital literacy, operational efficiency, cost of compliance, transaction transparency, and preference for UPI payments among small business owners. The study also analyses how these factors affect business outcomes such as profitability, cash flow management, and overall business performance. Guided by theories related to digital adoption and tax compliance, the research evaluates the behavioural response of small business owners toward digital taxation systems. Data were collected from small business owners in Coimbatore using a structured questionnaire and analysed using statistical tools such as ANOVA, regression analysis, and chi square tests. The findings of the study are expected to provide valuable insights for policymakers to strengthen digital tax systems, for financial institutions to understand small business financial behaviour, and for entrepreneurs to adopt efficient digital compliance practices. The study ultimately contributes to understanding how digital payment integration with taxation can support transparency, accountability, and sustainable growth of small businesses.

KEYWORDS: Unified Payments Interface (UPI), Goods and Services Tax (GST), Small Businesses, Digital Payments, Tax Compliance, Transaction Transparency, Business Performance.

Paper Id: A534

**Emerging trends of marketing with virtual influencers
and Conversational AI for consumer engagement**

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ABSTRACT

With the rapid advancements of Artificial Intelligence in Marketing, Conversational AI, and Virtual influencers, also known as synthetic influencers or virtual personas plays a pivotal role in consumer engagement. With the advancement of digital technologies in the digital era of marketing, Artificial Intelligence has profoundly impacted branding in today's marketing trends prominently through Virtual influencers and Conversational AI agents. The research study on the emerging trends of conversational AI, like AI chatbots, virtual influencers engaged with customers on social media platforms like Instagram, Facebooks etc. Virtual influencers engage with customers through digital environments on social media platforms such as Instagram posts and comments, and Conversational AI agents like chatbots and voice assistants are service-oriented. Both Virtual influencers and Conversational AI represent an emerging form of AI-based brand interactions that are employed in customer engagement, which represents the paradigm shift in the new trends of marketing communication. The study includes consumer perceptions, attitudes, and behavioral intentions in response to interactions with Virtual influencers as compared to traditional human influencers. The purpose of this study is to examine the emerging trends of marketing with virtual influencers and Conversational AI for consumer engagement with perceptions, attitudes, and behaviors, with the broader aim of contributing to the theoretical understanding and managerial practice in contemporary digital marketing.

Keywords:- Artificial Intelligence, Virtual Influencers, Conversational AI, Consumer Perceptions, Consumer Engagement

Paper Id: A535

A CRYPTOGRAPHICALLY SECURED MACHINE LEARNING FRAMEWORK FOR PRIVACY-PRESERVING MALICIOUS URL DETECTION

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Abstract

Phishing attacks have become a significant and growing Threat in the realm of online security, as they manipulate Unsuspecting users into visiting fraudulent websites that Closely mimic legitimate platforms. These malicious URLs Are increasingly appearing in search engine results, Emails, advertisements, and social media links, placing Users at constant risk of having sensitive personal and financial information stolen. Traditional detection Mechanisms such as blacklisting, whitelisting, and Browser-based plugins have proven to be limited in scope and often fail to provide sufficient protection against Evolving phishing techniques. Many of these approaches Focus solely on known attack patterns, making them Ineffective against newly created phishing websites that Have not yet been reported or added to blacklists. Additionally, certain browser plugins rely on server-side Verification for threat detection, which raises privacy Concerns by potentially exposing user browsing data and Behavioural patterns to third parties. To overcome these Challenges, the proposed project introduces a novel Privacy-Preserving Safe Browsing (PPSB) framework that Enhances phishing URL detection while prioritizing user Data confidentiality. The system employs a Support Vector Machine (SVM) classifier to accurately categorize URLs into safe or malicious types, enabling real-time and Intelligent detection of threats. To secure sensitive user Information, including browsing history and behavioural Patterns, all communications between the client and Server are protected using Advanced Encryption Standard (AES) encryption. This approach ensures that data is Transmitted securely and cannot be intercepted or Misused. Beyond detection, the framework incorporates Support for privacy-preserving online behaviour analysis Using differential privacy techniques, allowing aggregated Insights without compromising individual confidentiality.

Keywords: Phishing detection, Privacy-Preserving Safe Browsing (PPSB), Support Vector Machine (SVM), URL classification, Advanced Encryption Standard (AES), Differential privacy, Online security.

Paper Id: A536

ROUGE-Optimized YouTube Video Summarizer with RAG-Based AI Question Answering and Local Generative Response Formatting

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Abstract

The rapid growth of educational content on YouTube makes it difficult to efficiently extract key information from lengthy videos, as videos lack the skimming capability of text. This paper proposes a ROUGE-optimized YouTube video summarizer with a Retrieval-Augmented Generation (RAG)-based question answering system, implemented as a Chrome extension. The system operates fully locally, ensuring data privacy and offline usability after transcript retrieval. It uses BART-large-CNN for abstractive summarization, where transcripts are cleaned, segmented with contextual overlap, and processed to maintain coherence. A local generative model further refines the output into concise summaries and highlights, achieving compression rates of 75–97%. For question answering, transcript chunks are embedded using all-mpnet-base-v2 and indexed with FAISS, followed by re-ranking and answer extraction using RoBERTa-large-SQuAD2. A similarity-based guardrail is applied to reject irrelevant queries and prevent incorrect responses. Experimental results across multilingual videos show ROUGE-1 precision between 96% and 100%, with improved F1 scores after refinement, and 97% accuracy in answering relevant queries. The proposed system offers an efficient, reliable, and privacy-preserving solution for automated video understanding.

Keywords: Abstractive Summarization, BART Transformer, ROUGE Evaluation, Retrieval-Augmented Generation, FAISS, RoBERTa, Chrome Extension, YouTube Transcript API, Local Generative Model, Natural Language Processing.

Paper Id: A537

Time Cognitive System For Plastic Waste Classification And Urban Recycling Optimization

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Abstract

Globally urban plastic waste mismanagement creates an enormous environmental problem due to poor source separation and the visual similarities of recyclable and non-recyclable plastic; yet we can only resolve this issue through heterogeneous plastic identification. In this paper, we discuss system, which is a real-time cognitive function that is designed using a dual-layered computer vision pipeline combined with OpenCV contour-based analysis to detect, classify, and evaluate the multiple types of plastics in dynamic real-world environments. It do not only detect using bounding-box methods, but also integrate three new analytical modules: Contamination Analysis Module that incorporates color variance, stained pixel ratios, and Laplacian noise estimation and Degradation and Recyclability Prediction Module that integrates base portion scores for the various material types, contamination deductions, as well as density based upon the presence of structural edges and combined Smart Plastic Quality Score that aggregates detection confidence, cleanliness, and recyclability into a single metric that can be acted upon. Additionally, the Streamlit-based dashboard operates on creating less than 500ms per frame and creates structured PDF audit reports. The experimental results indicate that proposed system has significantly better recall at identifying amorphous plastic over approaches that are limited to only using a single model.

Keywords: Urban Plastic Waste Management, Plastic waste classification, contamination analysis, recyclability scoring, computer vision.

Paper Id: A538

PORTABLE IOT-BASED MULTI-SENSOR FOOD ADULTERATION DETECTION SYSTEM

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Abstract

Food adulteration is a growing problem in which harmful chemicals, artificial additives, preservatives, and synthetic colors are mixed with food products to increase shelf life and reduce costs, often affecting their quality and safety. To address this issue, a Portable IoT-Based Multi-Sensor Food Adulteration Detection System is proposed to enable rapid and reliable detection of adulterants in food items and packaged juices. The system integrates sensors such as a pH sensor, TDS sensor, electrical conductivity sensor, MQ135 gas sensor, TCS34725 color sensor, and DS18B20 temperature sensor to analyze key parameters including acidity, dissolved solids, ionic concentration, chemical gases, and artificial color variations. These sensors operate within defined ranges, such as pH 0–14, TDS up to 1000 ppm, and conductivity up to 2000 $\mu\text{S}/\text{cm}$, which helps in identifying abnormal or contaminated food samples. An ESP32 microcontroller processes the sensor data and determines the level of adulteration by comparing the values with predefined threshold limits. The device includes a touch display for real-time result monitoring and operates using a rechargeable lithium battery, making it portable and suitable for field use. It can be used in markets, food industries, and by consumers for quick quality assessment. Experimental results show that the system can achieve approximately 80–90% detection accuracy, providing a cost-effective, reliable, and user-friendly solution for rapid food safety monitoring.

Keywords: Food Adulteration, IoT-Based System, Multi-Sensor Detection, ESP32, pH Measurement, TDS, Electrical Conductivity, MQ135 Gas Sensor, Color Detection.

Paper Id: 539

**A STUDY ON THE INFLUENCE OF DIGITAL
MARKETING STRATEGIES OF ONLINE LEARNING
PLATFORMS AMONG MBA STUDENTS IN
COIMBATORE**

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ABSTRACT

The rapid growth of online learning platforms has increased the importance of digital marketing in attracting and engaging learners. This study titled “A Study on the Influence of Digital Marketing Strategies of Online Learning Platforms among MBA Students in Coimbatore” examines how digital marketing strategies impact awareness, trust, enrolment decisions, and engagement among MBA students. The research adopts a descriptive design using primary data collected through a structured questionnaire, and the data were analysed using SPSS with statistical tools such as descriptive statistics and Pearson correlation. The findings reveal that social media promotions, online advertisements, and free trial content play a significant role in creating awareness and encouraging enrolment. Digital marketing strategies positively influence learner trust and motivation, with motivation emerging as a key factor linking marketing efforts to course completion behaviour. However, factors such as content quality and personal interest also contribute to sustained engagement. The study concludes that well-planned, personalized, and learner-centric digital marketing strategies are essential for the sustainable growth of online learning platforms and for enhancing professional development among MBA students.

Paper Id: 540

A Synthetic Data–Driven Framework for Heart Failure Survival Prediction and Clinical Decision Support

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Abstract

It is pretty important to predict the survival of heart failure patients accurately for risk stratification and personalized treatment planning, but there are obstacles in the way of developing reliable data-driven models due to limited data availability and strict privacy regulations. In this respect, the present work proposes a synthetic data– driven framework for heart failure survival analysis, integrating privacy-preserving data generation with state-of-the-art survival modeling and clinical decision support. This approach generates synthetic clinical datasets by leveraging generative learning techniques to approximate the joint distribution of patient attributes and survival outcomes. These datasets can be utilized to train different types of survival models, from classical Cox Proportional Hazards and Random Survival Forests to more recent artificial intelligence techniques like DeepSurv and DeepHit. The model is also evaluated using discrimination and calibration metrics in addition to the train on synthetic test on real scenario. The performance indicates that models trained on synthetic data perform nearly as well as those trained on real data. The differences in performance in terms of concordance index and Brier score are minor. The excellent performance of TSTR in this scenario justifies how synthetic data can be used to protect against the risk of information disclosure. The method also allows us to investigate the possibilities of individualized therapy schemes through what-if scenarios to quantify the change in prediction outcome in response to different decisions regarding therapy. To sum up, this is an excellent model that allows us to make survival prediction decisions in heart failure therapy in an affordable and privacy-friendly way

Paper ID A541

Role of Artificial Intelligence in India's Defence Sector

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Abstract

India is rapidly integrating Artificial Intelligence (AI) into its defence sector to achieve technological superiority, focusing on autonomous weapons, surveillance, and predictive maintenance. At present, 75 projects are underway to enhance border security, drone swarms, and cybersecurity. India is aiming to reduce human risk and strengthen indigenous capabilities through Atmanirbhar Bharat or Self-Reliant India. India is a new entrant in the field of AI, but rapidly emerging as a top-three global powerhouse in Artificial Intelligence competitiveness, trailing only the US and China. This paper presents a comprehensive analysis how India can improve its AI capacity especially in the defence sector. It explores why India needs to increase its Computational Power and expand Data Center Capacity. Moreover, the need to bridge the gaps in scalable deployment, interoperability and access to defence-grade datasets are highlighted. The study further discusses why India must increase allocations for AI infrastructure to secure data ecosystems and testing environments, allowing technologies to move from pilot projects to frontline use.

Keywords: Artificial Intelligence, Defence Sector, Atmanirbhar Bharat, Computational Power, Data Center

Paper Id: A542

Early Disease Prediction Using Data Science Techniques

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Abstract

Early disease prediction has emerged as a critical application of data science in modern healthcare, enabling timely diagnosis and improved patient outcomes. This project focuses on leveraging data science techniques such as data preprocessing, feature selection, and machine learning algorithms to predict the likelihood of diseases at an early stage. By analyzing structured medical datasets containing patient information—such as age, symptoms, medical history, and laboratory results—the system aims to identify patterns and correlations that may not be easily detectable through traditional diagnostic methods.

Various supervised learning algorithms, including Decision Trees, K-Nearest Neighbours (KNN), Support Vector Machines (SVM), and Logistic Regression, are applied and compared to determine the most accurate predictive model. The model is trained and validated using historical healthcare data, ensuring reliability and generalization. Performance metrics such as accuracy, precision, recall, and F1-score are used to evaluate the effectiveness of the models.

The proposed system not only enhances early detection but also assists healthcare professionals in decision-making by providing data-driven insights. Furthermore, it helps reduce diagnostic errors, lowers healthcare costs, and improves overall efficiency in medical services. This project demonstrates how integrating data science techniques with healthcare systems can contribute to proactive disease management and ultimately lead to better public health outcomes.

Keywords: Early Disease Prediction, Data Science, Machine Learning, Healthcare Analytics, Predictive Modeling, Medical Data Analysis

Paper Id: A543

Optimization and Performance Evaluation of *Bacillus subtilis*–Induced Self-Healing Concrete

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Abstract

Concrete suffers from inherent brittleness, making it susceptible to micro-cracking which facilitates reinforcement corrosion and structural failure. This study evaluates an M25-grade Bacterial Self-Healing Concrete leveraging Microbial-Induced Calcite Precipitation (MICP) for autonomous crack sealing. *Bacillus subtilis*, a resilient spore-forming bacterium, was encapsulated within Diatomaceous Earth (DE)—a porous, pozzolanic material—replacing 5% and 10% of OPC 53 Grade cement by weight, with Calcium Lactate as the nutrient. Designed per IS 10262:2019 with a 1:1:2 mix ratio, 150 mm cubes were tested for compressive strength at 7 and 28 days. Results disproved concerns regarding structural degradation from bio-additives; the 5% replacement achieved optimal peak strength, outperforming the control mix due to the pozzolanic activity of DE. Artificial micro-cracks (0.2 mm to 0.4 mm) were induced via controlled CTM loading at 60% capacity. Following a 21-day submerged healing period, visual inspection of 5% and 10% DE specimens confirmed the autonomous deposition of dense, white Calcium Carbonate crystals bridging the crack lines. Conversely, control specimens showed zero closure, proving healing was entirely attributable to the MICP process. The study validates DE as an efficient bio-carrier that enhances structural integrity and establishes bacterial concrete as a sustainable solution for extending infrastructure service life.

Keywords: Bacterial Self-Healing Concrete, MICP, *Bacillus subtilis*, Diatomaceous Earth, Calcium Lactate, M25, IS 10262:2019.

Paper Id: A544

**A Review of Security Enhancements in Fog Computing
with Present Cloud Models for Anxiety Prediction using
machine learning**

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Abstract

Machine Learning (ML) has emerged as a transformative force in the modern digital landscape, enabling intelligent systems to learn from historical data and generate predictive insights for enhanced decision-making and automation. With the exponential growth of big data, Internet of Things (IoT), cloud computing, and advanced digital infrastructures, ML plays a pivotal role in extracting meaningful information from large and complex datasets. Its capability to identify hidden patterns and relationships significantly contributes to technological innovation and research advancement. This paper presents a comprehensive analysis of the role of machine learning in facilitating knowledge discovery across emerging technological ecosystems. It explores various ML methodologies, system architectures, and algorithms, along with their practical applications in domains such as healthcare, cybersecurity, smart manufacturing, and intelligent transportation systems. In addition, an experimental framework is proposed to evaluate and compare the performance of different machine learning models in technological knowledge extraction. The study further discusses the key benefits, existing challenges, and future directions of machine learning-driven technological environments.

Paper Id: A545

Artificial Intelligence–Driven Smart Governance Framework for Rural Development and Resource Optimization in Maharashtra

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Abstract

Rural development in Maharashtra plays a crucial role in socio-economic transformation, as nearly half of the state's population resides in rural areas. Despite numerous government initiatives under departments such as Maharashtra Rural Development Department, inefficiencies persist in resource allocation, monitoring, transparency, and real-time decision-making. Traditional governance mechanisms lack predictive analytics, intelligent monitoring, and data-driven optimization. This research proposes an Artificial Intelligence (AI)–Driven Smart Governance Framework designed to enhance rural development planning, optimize resource distribution, detect anomalies in welfare schemes, and enable predictive decision-making. The proposed framework integrates machine learning, geospatial analytics, Internet of Things (IoT), and big data processing to create an intelligent governance ecosystem. The study introduces a mathematical optimization model for rural resource allocation and evaluates system performance through simulation-based experiments. The framework aims to improve transparency, reduce corruption risks, enhance beneficiary targeting accuracy, and maximize development outcomes across rural Maharashtra.

Keywords Artificial Intelligence, Smart Governance, Rural Development, Resource Optimization, Predictive Analytics, Maharashtra, E-Governance, Machine Learning.

Paper Id: A546

Spatio Temporal Intrusion Detection System In Network Traffic Using Multi layer perceptron (MLP)

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ABSTRACT

Network security has become a critical concern due to the rapid growth of internet usage, cloud services, and interconnected devices. Modern cyberattacks are increasingly sophisticated, exploiting both spatial and temporal patterns within network traffic to bypass traditional security mechanisms. Conventional intrusion detection systems often rely on static rule-based approaches or signature matching techniques, which are not effective against evolving threats such as zero-day attacks, distributed attacks, and complex multi-stage intrusions. To address these limitations, this project proposes a Spatio-Temporal Intrusion Detection System (IDS) that analyzes network traffic using a Multi-Layer Perceptron (MLP) based deep learning model. The proposed framework captures both spatial characteristics (such as packet features, protocols, and flow attributes) and temporal behaviors (such as traffic patterns over time) to accurately identify malicious activities within the network. The system begins by collecting and preprocessing network traffic data, including feature extraction and normalization to improve model performance. Temporal relationships in the traffic data are structured to represent sequential patterns, while spatial features describe the statistical properties of the network flows. These combined features are then fed into an MLP model that learns complex nonlinear relationships between normal and malicious traffic patterns. During the training phase, the model learns to distinguish between legitimate and intrusive activities by analyzing large volumes of labeled network traffic data. In the detection phase, the trained MLP model evaluates incoming traffic in real time and classifies it as either normal or suspicious. By leveraging spatio-temporal feature representation and deep learning capabilities, the proposed system enhances detection accuracy, reduces false positives, and improves the ability to detect previously unseen attacks. Overall, this approach provides an intelligent and scalable intrusion detection mechanism that strengthens network defense by identifying abnormal traffic behavior and preventing potential cyber threats effectively.

KEYWORDS: Spatio-Temporal Analysis, Intrusion Detection System (IDS), Network Security, Multi-Layer Perceptron (MLP), Deep Learning, Network Traffic Analysis, Anomaly Detection, Cybersecurity, Machine Learning, Data Preprocessing, Feature Extraction, Attack Detection, Traffic Classification.

Paper ID A547

Thermal Characteristics of SRM using ANSYS

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Abstract

Switched Reluctance Motors (SRMs) have gained significant attention in modern electric drive applications due to their simple construction, robustness, fault tolerance, and absence of permanent magnets. However, their highly nonlinear magnetic characteristics and concentrated winding structure often lead to significant thermal challenges, affecting efficiency, reliability, and lifespan. This study presents a detailed analysis of the thermal characteristics of an SRM using ANSYS simulation tools, focusing on temperature distribution, heat flow paths, and thermal limits under various operating conditions. The thermal behaviour of the SRM is primarily influenced by copper losses in the stator windings, core losses in the laminated steel, and additional stray losses. In this work, a coupled electromagnetic-thermal analysis is carried out using ANSYS Maxwell and ANSYS Thermal modules. Initially, electromagnetic simulations are performed to estimate the losses generated within the motor components. These losses are then mapped as heat sources in the thermal model to evaluate steady-state and transient temperature profiles. A detailed finite element model (FEM) of the SRM is developed, incorporating material properties such as thermal conductivity, specific heat, and convection coefficients. Boundary conditions are defined to represent realistic cooling methods, including natural and forced air convection. The simulation results illustrate the temperature rise in critical regions such as stator windings, stator core, and rotor poles. It is observed that the stator windings experience the highest temperature due to concentrated current flow and limited heat dissipation paths. The analysis further investigates the impact of operating parameters such as load current, switching frequency, and ambient temperature on the thermal performance of the motor. Results indicate that higher currents and switching frequencies significantly increase the temperature rise, potentially leading to insulation degradation if not properly managed. The effectiveness of different cooling strategies is also evaluated, demonstrating that improved ventilation and enhanced thermal conductivity materials can significantly reduce hotspot temperatures. The ANSYS-based thermal analysis provides valuable insights into the design optimization of SRMs. By identifying critical thermal zones and understanding heat transfer mechanisms, designers can implement effective cooling techniques and material selection to enhance motor performance and reliability. The study concludes that accurate thermal modelling is essential for the safe and efficient operation of SRMs, particularly in high-performance and industrial applications. Overall, this work highlights the importance of integrating thermal analysis in the design phase using ANSYS tools, enabling improved prediction of temperature behaviour and supporting the development of more efficient and durable switched reluctance motor systems.

Keywords— Switched Reluctance Motor (SRM), thermal analysis, ANSYS simulation, finite element method (FEM), electromagnetic-thermal coupling, temperature distribution, heat transfer, copper losses, core losses, thermal modelling, hotspot analysis, cooling techniques, motor efficiency.

Paper Id: A548

Study of Various N-Containing Energetic Compounds

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Abstract

Nitrogen-containing energetic materials release a large amount of energy rapidly due to the presence of high-energy N–N, N=N, or N≡N bonds. These compounds are widely used in explosives, Propellants and Pyrotechnics. The high energy release is mainly due to the formation of stable nitrogen gas during decomposition. Energy conversion and storage materials have emerged as a promising field of materials science study in recent years. Because of their high heat of synthesis, high density, customized thermal stability, and detonation capability, nitrogen-based energetic compounds have garnered a lot of attention in the field of energetic materials. Numerous energetic compounds with good uses in explosives, propellants, and pyrotechnics have been produced to satisfy the growing demands of high power, low sensitivity, and eco-friendliness. Azole analogues have been used as bifunctional ligands for metal catalysis and as building blocks in organic synthesis for the creation of agrochemicals and pharmaceuticals. In this study, several heterocyclic compounds, including pyrazole, imidazole, and triazole-based energetic molecules etc. were effectively synthesized and characterized by IR spectroscopy, NMR spectroscopy.

Keywords: Energy, Heterocyclic compounds, energetic materials, Azole.

Paper Id: A549

DESIGN AND DEVELOPMENT OF A PARALLEL CAPACITIVE SLOT ANTENNA FOR Wi-Fi 6G APPLICATION

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Abstract

The rapid progress of sixth-generation (6G) wireless technology has intensified antenna design challenges, requiring compact, wideband, and multi-standard compatible solutions. This work presents a compact parallel capacitive-slotted superwideband antenna designed and experimentally validated for 6G and related applications. Fabricated on a flexible 3850 substrate with dimensions of $60 \times 40 \times 0.1 \text{ mm}^3$, the antenna remains lightweight, thin, Ultralam and suitable for conformal deployment. Wideband performance is achieved through optimized capacitive slot loading and a microstrip feeding arrangement, ensuring improved impedance matching across 1.74–100 GHz, yielding a bandwidth ratio of 57.47:1. Resonances at 2.34, 3.6, 4.3, 6.6, and 8 GHz make it suitable for multiple communication bands. Simulated and measured results show close agreement, confirming stable radiation, low return loss, reasonable gain, and acceptable VSWR. Owing to its compactness and performance, the antenna is applicable in 6G, Wi-Fi, WIMAX, Bluetooth, WLAN, and IoT systems.

Keywords— 6G wireless communication, super-wideband antenna, capacitive slot loading, flexible substrate antenna, Ultralam 3850, impedance bandwidth enhancement, millimeter-wave communication, IoT antenna design.

Paper Id: A550

Soil Classification Using Deep Learning

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Abstract

Soil classification plays a crucial role in agriculture, geotechnical engineering, and environmental monitoring. Traditional soil classification methods rely on physical and chemical testing, which are time-consuming, costly, and labor-intensive. Recent advances in Artificial Intelligence (AI) and Deep Learning (DL) have enabled automated soil analysis using image and data-based approaches. This paper presents a Deep Learning-based approach for soil classification using Convolutional Neural Networks (CNNs). The proposed model classifies soil types based on texture, color, and moisture content extracted from soil images. The dataset is preprocessed through normalization, augmentation, and feature enhancement to improve generalization. Experimental results demonstrate that the proposed CNN model achieves superior accuracy and robustness compared to traditional machine learning classifiers such as Support Vector Machines (SVM) and Random Forests. The model offers a scalable and efficient solution for real-time soil identification in agricultural and construction applications.

Keywords: Deep Learning, Soil Classification, Convolutional Neural Network (CNN), Image Processing, Agriculture Technology, Artificial Intelligence.

Paper Id: A551

Smart Waste Segregation System Using Arduino with Real-Time Monitoring and Automated Classification

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Abstract

Waste management has become one of the major environmental challenges due to rapid urbanization and population growth. Improper disposal and poor segregation of waste materials lead to environmental pollution, inefficient recycling, and increased landfill accumulation. To address this issue, this project proposes a Smart Waste Segregation System that automatically detects and separates different types of waste such as metal, paper, and plastic using sensor based detection and intelligent classification techniques. The system aims to improve waste management efficiency while reducing human effort and promoting sustainable environmental practices. The proposed system integrates a microcontroller-based control unit with various sensors and actuators to perform automated waste classification. An ultrasonic sensor is used to detect the presence of waste materials when they are placed into the system. Based on the detected waste type, the microcontroller processes the input and activates a servo motor mechanism that directs the waste into the appropriate bin category. An LCD display provides real-time information about the waste type and system status, while a buzzer gives alert notifications to indicate successful detection and sorting. In addition to automatic segregation, the system also includes basic data analysis features to estimate annual waste generation and calculate the carbon footprint related to improper waste disposal. Based on this analysis, the system can provide recycling suggestions to encourage environmentally responsible behavior. This approach helps improve segregation accuracy, reduce manual intervention, and enhance recycling efficiency.

Keywords: Arduino, IoT.

Paper Id: A552

High-Performance Buck–Boost Converter for Stable Output in Battery-Operated Devices

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Abstract:

This paper presents a high-efficiency positive buck–boost DC–DC converter capable of operating effectively in buck, boost, and buck–boost modes. With the rapid advancement of battery-powered portable electronic devices, the demand for efficient and reliable power management solutions has significantly increased to extend battery life and enhance system performance. Conventional switching regulators, such as standalone buck or boost converters, are often unable to utilize the full battery voltage range while maintaining a stable and fixed output voltage. To address this limitation, a non-inverting buck–boost converter topology is proposed, which ensures seamless mode transition and continuous regulation across a wide input voltage range. The proposed converter is designed to deliver a programmable constant output voltage with high efficiency, reduced switching losses, and improved voltage regulation

Keywords: Positive buck boost converter, charging and discharging intervals.

Paper Id: A553

A Comprehensive Survey on Security Mechanisms in Cyber-Physical Systems: Detection, Architectural Reinforcement, and Control-Theoretic Perspectives

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Abstract

Cyber-Physical Systems (CPS) combine sensing, computation, communication, and control to enable intelligent interaction with physical processes across critical infrastructures, including power grids, transportation systems, healthcare platforms, and industrial automation environments. As CPS deployment continues to expand, security incidents increasingly manifest not merely as data breaches but as tangible disruptions to physical operations. Traditional cybersecurity mechanisms—largely designed for enterprise IT environments—are insufficient for CPS due to their real-time constraints, closed-loop feedback dynamics, and strict safety requirements. This survey examines CPS security through a layered resilience perspective that integrates runtime intrusion detection, secure architectural design, and control-theoretic defence strategies. We analyze cyber, physical, and hybrid attack models, compare representative defense approaches across abstraction layers, and discuss the trade-offs among scalability, latency, and robustness. The paper concludes by outlining open research challenges related to large-scale deployment, real-time operation, and the growing integration of artificial intelligence in CPS environments.

Keywords- Cyber-Physical Systems, CPS Security, Intrusion Detection, Secure Architecture, Control-Theoretic Security, Resilient Control

Paper Id: A554

Offline Payment Method

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Abstract

In the rapidly evolving digital landscape, secure and efficient financial transaction systems have become essential for both individuals and businesses. Conventional payment methods heavily rely on banking infrastructure, which often introduces delays, dependency on external servers, and limitations during network failures. To overcome these challenges, this project proposes the development of a Digital Payment Management System, a robust web-based application that facilitates seamless transactions through an internal wallet mechanism without direct bank integration. The system enables users to register, authenticate securely, and create a personalized digital wallet. A unique transaction PIN is implemented to authorize every financial activity, ensuring an additional layer of security. Users can perform key operations such as wallet top-up, peer-to-peer fund transfer, balance inquiry, and detailed transaction history tracking. The platform is designed with an intuitive user interface that enhances usability and provides a smooth user experience across devices. From an administrative standpoint, the system offers a comprehensive dashboard that allows administrators to monitor user activities, manage transaction records, and maintain system integrity. Real-time data processing ensures accurate tracking of all financial operations. The implementation of validation techniques prevents duplicate transactions, unauthorized access, and data inconsistencies, thereby maintaining high reliability and trustworthiness. A significant highlight of the system is its real-time transaction processing capability, which ensures that all payments are executed instantly within the application. The use of encrypted PIN verification and secure session handling mechanisms protects sensitive user data. Additionally, role-based access control restricts system functionalities based on user privileges, further strengthening security. The architecture of the application is designed to be scalable and modular, allowing easy integration with external payment gateways, banking APIs, and advanced features such as QR-based payments, notification systems, and analytics modules in the future. The use of modern technologies ensures high performance, responsiveness, and cross-platform compatibility. Performance optimization strategies are employed to minimize latency and improve system responsiveness even under high user load. The system undergoes rigorous testing to ensure reliability, security, and efficiency in real-world scenarios. By eliminating dependency on traditional banking systems and introducing a secure wallet-based transaction model, the proposed Payment Application provides a fast, flexible, and reliable solution for digital payments. It significantly reduces processing time, enhances user convenience, and supports the growing demand for efficient digital financial systems.

Keywords: Machine Learning, Deep Learning, Predictive Analytics, CNN, KNN.

Paper Id: A555

A VISION-ONLY HAND LANDMARK-BASED VIRTUAL MOUSE AND KEYBOARD SYSTEM FOR TOUCHLESS COMPUTING

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ABSTRACT

Human-computer interaction has traditionally depended on physical input devices such as keyboards and mice, which can limit accessibility and flexibility in modern computing environments. This project presents a Vision-Only Hand Landmark-Based Virtual Mouse and Keyboard System for Touchless Computing, designed to enable a fully hands-free and intuitive user experience through the integration of Computer Vision and Natural Language Processing (NLP). The system utilizes a standard webcam in combination with OpenCV and MediaPipe to detect and track real-time 3D hand landmarks. An optimized 8-level Moving Average Filter is implemented to enhance cursor stability by reducing noise and jitter, thereby ensuring high precision in pointer movement. Gesture recognition techniques are used to perform various mouse operations, including cursor navigation, clicking, double-clicking, and scrolling, based on the relative positioning of fingers. In parallel, the voice control module leverages the SpeechRecognition library to capture user commands, which are processed using a Large Language Model (LLM) to enable contextual understanding beyond predefined inputs. These commands are translated into system-level actions using PyAutoGUI, allowing users to open applications, execute keyboard shortcuts, perform web searches, and enable real-time voice-to-text typing. The entire system is integrated within a web-based interface developed using the Flask framework, providing a seamless platform for managing gesture tracking and voice interaction modules. Overall, the proposed system enhances accessibility, improves productivity, and delivers a futuristic, touchless computing experience suitable for diverse user environments.

Keywords: Human–Computer Interaction, Computer Vision, Hand Gesture Recognition, Touchless Computing, Speech Recognition

Paper Id: A556

Wireless sensor based malware detection deep learning

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Abstract

Wireless Sensor Networks (WSNs) are widely used in applications such as environmental monitoring, healthcare, and military systems. However, due to their limited resources and open communication environment, they are highly vulnerable to malware attacks. These attacks can disrupt network performance, compromise data integrity, and reduce system reliability. This project proposes a malware attack detection system for WSNs using deep learning techniques. The model is designed to analyze network traffic patterns and identify malicious activities with high accuracy. By leveraging deep learning algorithms such as neural networks, the system can automatically learn complex features from data and detect both known and unknown attacks. The proposed approach improves detection accuracy, reduces false positives, and enhances network security. Experimental results demonstrate that the deep learning-based model outperforms traditional detection methods in terms of efficiency and reliability. This system provides a robust and scalable solution for securing Wireless Sensor Networks against malware threats.

Paper Id: A557

MediVision AI: Intelligent Skin Disease Detection and Hospital Recommendation System

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Abstract

Skin diseases affect approximately one-third of the global population, yet access to qualified dermatological care remains critically limited, particularly in rural and semi-urban regions of developing nations. Delayed or inaccurate diagnosis of skin conditions leads to significant morbidity, escalating treatment costs, and, in cases of malignant lesions such as melanoma, potentially life-threatening consequences. This paper presents MediVision AI, a web-based intelligent skin disease detection and hospital recommendation system designed to bridge the gap between AI-assisted preliminary diagnostics and accessible healthcare navigation. MediVision AI employs a microservices architecture comprising a React.js frontend, a Node.js Express API gateway, and a Java Spring Boot AI microservice. The core diagnostic capability is powered by the Google Gemini Vision API, a state-of-the-art multimodal large language model, which analyses user-submitted skin lesion photographs and returns structured clinical assessments including the probable diagnosis, observed symptoms, confidence level, clinical description, and recommended next steps. Responses are returned as structured JSON objects, parsed and presented to the user in a clear, patient-accessible format. Diagnosis records are persistently logged to a PostgreSQL relational database, enabling users to maintain and retrieve their diagnostic history across sessions. A key distinguishing feature of MediVision AI is its integrated hospital recommendation module, which leverages the browser's native Geolocation API in conjunction with the Leaflet.js mapping library and OpenStreetMap tile and Overpass API data to identify and display dermatology hospitals and clinics within a five-kilometre radius of the user's current location. This module directly connects users who receive a preliminary diagnosis with actionable healthcare navigation, a feature absent from existing AI diagnostic tools. System evaluation was conducted over 160 test images drawn from publicly available dermatological repositories and consumer smartphone photographs spanning conditions including psoriasis, tinea corporis, contact dermatitis, atopic dermatitis, acne vulgaris, vitiligo, and pigmented lesions. The system achieved an overall diagnostic accuracy of 87.3%, with an average end-to-end API response time of 2.7 seconds. A formative usability evaluation involving twelve participants confirmed the accessibility of the interface to non-specialist users. Feature comparison against existing systems demonstrated that MediVision AI uniquely combines broad multi-disease coverage, natural-language diagnostic explanations, and geospatial hospital recommendations within a single, freely accessible web platform. The proposed system demonstrates the feasibility and practical utility of deploying large multimodal AI models as flexible, explainable diagnostic engines in resource-constrained healthcare contexts, without requiring custom-trained deep learning models or specialised imaging hardware. Future work will focus on domain-specific model fine-tuning using curated dermatological datasets, multilingual interface support, native mobile application development, and FHIR-compliant integration with hospital electronic health record systems.

Keywords: Skin disease detection, Artificial intelligence, Google Gemini Vision API, Hospital recommendation system, React.js, Java Spring Boot, Microservices architecture, OpenStreetMap, Dermatology, Deep learning.

PAPER ID:A558

Integrated Aerodynamic and Stealth Optimization of a B-2-Inspired Flying Wing via Mid-Span Thickness Refinement

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Abstract

The design and optimization of a flying-wing airframe require a high degree of multidisciplinary integration due to the inherent coupling between aerodynamic stability and low-observable characteristics. This study presents a detailed performance analysis and geometric refinement of a UAV platform inspired by the B-2 Spirit, utilizing a baseline wingspan of 4110.65 mm and a root chord of 2152.48 mm. The research specifically addresses the longitudinal "pitch-up" instability and induced drag penalties common in tailless aircraft through systematic spanwise thickness-to-chord (t/c) optimization. By iteratively increasing the root t/c ratio from 0.12 to 0.14 and the mid-span t/c from 0.10 to 0.12, the design achieves an enhanced pressure recovery profile without introducing stealth-degrading surface discontinuities. High-fidelity Computational Fluid Dynamics (CFD) simulations conducted at a cruise velocity of Mach 0.75 (230 m/s) reveal that these geometric modifications resulted in a 10.2% increase in total lift force, reaching 1.93×10^6 N, and an 11.6% reduction in total drag. The resulting aerodynamic efficiency, characterized by an L/D ratio improvement from 14.6 to 18.2, demonstrates a significant boost in operational endurance. Furthermore, the airframe's internal volume was optimized to accommodate MXene-based electromagnetic coatings and graphene aerogels, facilitating broadband radar absorption. The findings confirm that mid-span thickness refinement serves as an effective passive mechanism for enhancing both the aerodynamic and stealth performance of next-generation flying-wing UAVs.

Keywords: Flying Wing, Stealth UAV, Aerodynamic Optimization, Thickness-to-Chord (t/c) Ratio, Computational Fluid Dynamics (CFD), B-2 Spirit, Radar Absorbing Materials (RAM), MXenes.

PAPER ID: A559

Solid State Batteries: The Future of Energy Storage

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Abstract

Solid-state batteries represent a promising advancement in energy storage technology, offering significant improvements over conventional lithium-ion batteries. Unlike traditional batteries that use liquid electrolytes, solid-state batteries utilize solid electrolytes, which enhance safety by reducing the risk of leakage, overheating, and fire. These batteries also provide higher energy density, enabling longer battery life and extended driving range for electric vehicles and improved performance in portable electronics. Additionally, solid-state technology supports faster charging and potentially longer cycle life, making it an attractive solution for next-generation energy systems. Researchers and companies such as Toyota, Samsung, and Quantum-Scape are actively investing in the development and commercialization of this technology. Despite challenges such as high manufacturing costs and material limitations, ongoing research continues to address these barriers. As innovation progresses, solid-state batteries are expected to play a crucial role in advancing electric mobility, renewable energy storage, and sustainable power solutions worldwide.

Keywords: Solid State Batteries, Energy Storage Technology, Solid Electrolyte, Fast Charging, Electric Vehicle.

Paper Id: A560

AI-Based Predictive Maintenance of Electrical Machines

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Abstract

Electrical Machine play a vital role in industrial and power system applications, where unexpected failures can lead to significant operational losses and increased maintenance costs. Traditional maintenance strategies such as reactive and scheduled maintenance are often inefficient, as they either respond after failure or do not accurately predict machine health. To overcome these limitations, this study proposes an Artificial Intelligence (AI)-based predictive approach for electrical machines to enhance reliability and reduce downtime. The proposed system utilizes real-time data acquired from sensors measuring parameters such as vibration, temperature, current, and voltage. These data are processed and analyzed using machine learning algorithms to identify patterns and detect early signs of faults. Techniques such as classification and regression models are employed to predict potential failures before they occur. The methodology involves data preprocessing, feature extraction, model training, and performance evaluation using simulation tools. The results demonstrate that AI-based predictive maintenance can accurately forecast faults such as bearing failures, insulation degradation, and rotor imbalances with high precision. This approach not only minimizes unexpected breakdowns but also optimizes maintenance schedules, thereby reducing operational costs and improving system efficiency. In conclusion, the integration of AI in predictive maintenance provides a smart and efficient solution for monitoring the health of electrical machines. The proposed system enhances reliability, extends machine lifespan, and supports the development of intelligent and automated industrial systems. Keywords: Artificial Intelligence, Predictive Maintenance, Electrical Machines, Machine Learning, Fault Detection, Condition Monitoring

Paper Id: A561

AI-Based Smart Energy Management System for Occupancy Detection in Buildings

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Abstract

Energy wastage is a very common problem, especially when electrical devices such as lights fans, and air conditioners are left ON for no reason. This happens due to human negligence, where people forget to turn OFF the devices after leaving a particular room. This is very common in classrooms, offices, and hostels, where continuous monitoring is not possible. This leads to wastage of electricity and increases the electricity bills. In this paper, a smart energy management system using AI is proposed, where the electrical devices can be efficiently managed using occupancy detection. The proposed system makes use of sensors such as motion detectors and infrared sensors, which detect whether a person is present in a particular room or not. The collected data is processed using a simple intelligent algorithm. The system is tested under various real-time conditions to check its performance. If no human is found within a specific time, the system switches off the electrical appliances, saving energy from being wasted. When a human enters the room, the system switches on the electrical devices quickly, ensuring maximum convenience. This is a simple yet highly efficient system for saving energy from being wasted. In addition to saving energy, this system is also helpful for ensuring maximum convenience for people. The system reduces human error and is easy to use. This system can be used for both residential and commercial purposes. The system can be integrated with other smart home technologies, ensuring maximum flexibility. The proposed system can be enhanced by using more sophisticated AI models and mobile apps for easy control in the future. In conclusion, the proposed system is highly efficient and cost-effective for saving energy. The proposed system is helpful for saving electricity wastage and ensuring maximum savings. The proposed system is highly efficient for saving energy and can be implemented for maximum benefits.

Keywords: Artificial Intelligence, Smart Energy Management, Occupancy Detection, Motion Sensors, Energy Efficiency, Smart Buildings

Paper Id: A562

DIGITAL TRANSFORMATION IN HUMAN RESOURCE MANAGEMENT: AI, TRANSPARENCY, AND EMPLOYEE ENGAGEMENT IN THE MODERN WORKPLACE

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ABSTRACT

The HRM situation has changed significantly within the last few years particularly the recent past following the development of digital technology. Organization success has greatly relied on artificial intelligence and digital technology. This paper seeks to address the various effects of the digital technology on human resource management. This study has established the necessity of organizations to embrace digital technology in managing their human resources with the changes in technology.

Issue: There is a dilemma in the effective adoption of digital HR technology in organizations as organizations also strive to ensure that employees are engaged and that the organization is also transparent. There is an existing difference between the potential of technology and the use of human-cantered approaches in enhancing trust and ethical AI within the company.

Procedure: It was done through an in-depth literature review, synthesizing 45 articles, published in 2021-2026. Several sources were used in data collection including academic journals, reports, and case studies of famous organisations in the world.

Findings: It was found that implementation of AI-based HR technology led to the substantial increase of efficiency of business operations, particularly the recruitment process (up to 70% time-to-hire reduction), employee performance, and quality of business decisions. Organizations that embraced a gradual employee-based strategy towards AI-based HR technologies achieved a much higher adoption and retention rates as compared to organizations that embraced one-way deployment strategies. It was discovered that investor confidence increased due to the use of digital transparency tools using workforce metrics based on data.

Conclusion: It is possible to conclude that the digital HR transformation should be effectively implemented through the combination of the most advanced technologies with cultural values, ethical standards, and customer-cantered designs. Companies with the focus on open communication, training, and an employee-focused attitude towards technology use have better employee engagement and business performance.

Keywords: Digital transformation, Artificial Intelligence, HR automation, Employee engagement, corporate transparency, Organizational performance, Digital HRM

Paper Id: A563

IOT-DRIVEN ADAPTIVE TRAFFIC SIGNAL SYSTEM WITH INTEGRATED ACCIDENT DETECTION AND AMBULANCE CLEARANCE

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Abstract

Traffic congestion and delayed emergency response are major challenges in modern urban transportation systems. Conventional traffic signals operate on fixed timing mechanisms that do not adapt to real-time traffic conditions, resulting in inefficient traffic flow and increased waiting times. To address these issues, this paper proposes an IoT-driven adaptive traffic signal system integrated with accident detection and ambulance clearance mechanisms. The proposed system uses computer vision techniques with YOLO object detection and OpenCV to analyze real-time traffic video streams and estimate vehicle density at intersections. Based on the detected traffic density, the system dynamically adjusts signal timings to optimize traffic flow. In addition, the system detects approaching emergency vehicles such as ambulances and immediately provides priority clearance by switching the corresponding lane to green while holding other lanes at red. The system also incorporates an accident detection module that identifies collision events from video frames and automatically sends real-time alerts, including captured images and timestamps, to the traffic control center and nearby hospitals through IoT communication and SMS notification using Twilio API. The traffic signal hardware is controlled using an ESP32 microcontroller connected to an LED signal board. The proposed system improves traffic efficiency, reduces congestion, and enhances emergency response by integrating artificial intelligence, IoT connectivity, and automated traffic signal control. This approach provides a cost-effective and scalable solution for smart city traffic management systems.

Keywords: IoT, Smart Traffic System, ESP32, YOLO, OpenCV, Accident Detection, Ambulance Priority, Intelligent Transportation System.

PAPER ID : A564

PUBLIC TRANSPORTATION DELAY ANALYSIS THROUGH MACHINE LEARNING ALGORITHMS

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ABSTRACT

This project, titled “Public Transportation Delay Analysis Through Machine Learning Algorithms,” focuses on addressing one of the major challenges in urban transportation systems unpredictable delays. Public transport delays are caused by factors such as traffic congestion, weather conditions, route variations, and time-based patterns, which are not effectively handled by traditional systems. The proposed system introduces an intelligent delay prediction model using Machine Learning techniques. It processes real-time and historical data including GPS location, traffic density, weather conditions, travel time, and day variations. A regression-based model, specifically a Random Forest Regressor, is used to accurately predict delay duration. The system integrates dynamic traffic logic (peak hours and weekday/weekend variations) and weather impact analysis to improve prediction accuracy. It also calculates estimated arrival time (ETA) and total travel duration. A web-based dashboard using Python and Flask provides real-time tracking, route visualization, delay trends, and status updates. Additionally, prediction history is stored in a database for analysis and performance improvement. Compared to traditional static systems, this solution offers a real-time, data-driven approach to delay estimation, enhancing travel efficiency and supporting smart transportation systems.

Keywords: Machine Learning, Public Transportation, Delay Prediction, Traffic Congestion, Weather Analysis, Random Forest Regressor, GPS Tracking, Predictive Analytics.

Paper Id: A565

AI-Enabled Robotic Guide System for Guest Assistance and Navigation

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Abstract:

The AI-Enabled Robotic Guide System for Guest Assistance and Navigation presents an intelligent and autonomous solution for guiding visitors within large indoor environments such as educational institutions, corporate offices, hospitals, and industrial facilities. Conventional guest management systems rely heavily on human assistance and static signboards, which often become inefficient in complex layouts. The proposed system addresses these limitations by integrating artificial intelligence, autonomous navigation, and human–robot interaction into a unified robotic platform. The system features a touchscreen-based user interface that allows users to select their desired destination from a predefined list. Once a destination is selected, a Raspberry Pi-based control unit handles route planning, navigation, and voice interaction. The robot navigates indoors using a waypoint and junction- based line-following mechanism, eliminating the need for GPS. Infrared (IR) and ultrasonic sensors are employed for accurate line detection and real-time obstacle avoidance, ensuring safe and reliable movement. For precise localization and destination verification, ArUco markers are placed at key locations such as junctions and entry points. An onboard camera detects these markers to determine the robot’s position and confirm arrival at the intended destination. Additionally, the system enhances user interaction through audio-visual assistance, including text-to-speech announcements and on-screen guidance. Overall, the proposed system is cost-effective, scalable, and easy to deploy, making it suitable for both academic applications and real-world smart environments. It demonstrates the practical implementation of AI-driven indoor navigation and intelligent service robotics.

Keywords: Artificial Intelligence, Robotics, Indoor Navigation, Raspberry Pi, ArUco Markers, Human–Robot Interaction

Paper Id: A566

Design and Experimental Evaluation of a Miniature Electromagnetic Rail-Based Missile Launch System for Next-Generation Applications

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Abstract:

Electromagnetic launch systems are increasingly being explored as viable alternatives to conventional chemical propulsion for missile applications, primarily due to their capability to deliver high acceleration within short durations. In this work, a laboratory-scale electromagnetic missile launcher was designed, fabricated, and experimentally tested as part of a student-driven miniature project to examine the practicality of rail-based acceleration. The developed system employs a simplified railgun configuration consisting of two parallel copper rails and a conductive armature, energized through a controlled DC capacitor discharge circuit operating within 12–24 V. Peak discharge currents in the range of 80–120 A were achieved during operation. The interaction of current and magnetic field produces a Lorentz force, which drives the projectile along the rail length of 0.5 m. A series of experimental trials were conducted using projectiles with masses between 10 g and 20 g. The launcher consistently produced exit velocities in the range of 18–25 m/s, with estimated acceleration levels between 700 and 1200 m/s². The measured system efficiency was found to be in the range of 12–18%, with performance primarily limited by resistive losses, contact instability at the rail–armature interface, and localized thermal effects. Progressive rail surface degradation was also observed under repeated operation. Although the prototype operates at a significantly reduced scale, the experimental outcomes clearly demonstrate the feasibility of electromagnetic acceleration for projectile launch. The study highlights the importance of electrical contact quality, thermal management, and energy delivery systems in improving performance. These findings provide a foundational understanding for scaling electromagnetic launch technology toward advanced missile and high-speed launch applications.

Keywords: Electromagnetic Launch, Railgun, Lorentz Force, Missile Propulsion, Capacitor Discharge, High Acceleration Systems

Paper Id: A567

AgroPulse:IoT Driven Intelligent Irrigation with live Alerts

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Abstract

This IOT based Agriculture monitoring system makes use of wireless sensor networks that collects data from different sensors deployed at various nodes and sends it through the IOT Technology. This smart agriculture using IOT system is powered by Arduino with Temperature sensor, Moisture sensor, water level sensor, DHT11 Sensor, water motor, buzzer and node MCU. When the IOT based agriculture monitoring system starts it checks the water level, humidity and moisture level. It sends SMS alert on the phone about the levels. Sensors sense the level of water if it goes down, it automatically starts the water pump. If the temperature goes above the level, water motor starts. When any animal reach the agricultural land, the buzzer we attached to the Arduino will make the sound alert system. So that the animal will leave the land. Finally all data will be transferred to the IOT cloud system using node MCU module. In 1995, “thing to thing” was coined by BILL GATES. In 1999, IOT (Internet of Things) was come up by EPC global. IOT interconnects human to thing, thing to thing and human to human. The goal of IOT is bring out a huge network by combining different types connected devices. IOT targets three aspects Communication, automation, cost saving in a system. IOT empowers people to carry out routine activities using internet and thus saves time and cost making them more productive. IOT enables the objects to be sensed and/or controlled remotely across existing network model. IOT in environmental monitoring helps to know about the air and water quality, temperature and conditions of the soil, and also monitor the intrusion of animals in to the field. IOT can also play a significant role in precision farming to enhance the productivity of the farm.

Keywords: Internet of Things (IoT), Smart Agriculture, Intelligent Irrigation, Wireless Sensor Network, Soil Moisture Monitoring, Arduino, NodeMCU, Real-Time Monitoring, Cloud Computing, Precision Farming.

Paper Id: A568

DESIGN AND DEVELOPMENT OF AN AUTOMATED SMART IRRIGATION SYSTEM FOR EFFICIENT WATER MANAGEMENT

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Abstract

Water scarcity and inefficient irrigation practices are among the most critical challenges facing modern agriculture. Rapid population growth, climate change, and increasing demand for food have placed immense pressure on limited freshwater resources. Traditional irrigation methods, such as manual watering or time-based irrigation schedules, often lead to excessive water consumption, uneven distribution, and reduced crop yield. These methods do not consider real-time soil and environmental conditions, resulting in water wastage and inefficient farming practices. Therefore, there is a growing need for intelligent irrigation systems that can optimize water usage while maintaining healthy crop growth.

The design and development of an automated Smart Irrigation System that ensures efficient and sustainable water utilization by continuously monitoring soil and environmental parameters. The proposed system uses soil moisture sensors to measure the water content present in the soil, along with temperature and humidity sensors to assess surrounding environmental conditions. A microcontroller-based control unit acts as the core of the system, processing sensor data in real time and making irrigation decisions based on predefined threshold values suitable for specific crops.

When the soil moisture level falls below the required limit, the system automatically activates the irrigation mechanism using solenoid valves or water pumps. Once the soil reaches the desired moisture level, the system shuts off the water supply, preventing over-irrigation. This automated control ensures that crops receive an optimal amount of water, promoting healthy growth while conserving water resources. By eliminating the need for continuous human supervision, the system reduces labor costs and minimizes the possibility of human error.

The proposed smart irrigation system can be further enhanced by integrating Internet of Things (IoT) technology. IoT integration allows farmers to remotely monitor soil moisture, temperature, humidity, and system status through a mobile application or web interface. Real-time alerts and data visualization enable better decision-making and timely intervention in case of system faults or abnormal field conditions. Historical data storage also supports analysis of irrigation patterns and long-term crop management strategies.

Overall, this project demonstrates the effective application of automation, sensor technology, and IoT in agriculture. By optimizing irrigation based on real-time field conditions, the smart irrigation system contributes to improved agricultural productivity, conservation of water resources, and long-term sustainability, making it a practical solution for modern precision farming.

Keyword: - Real-time availability updates, Soil Moisture sensors, IOT enabled controller, weather forecasting irrigation, Water conservation, Automated Values.

Paper Id: A569

AGRI-ARBITRAGE FINDER

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Abstract

Farmers, traders, and consumers in the agricultural sector often face significant challenges in identifying the most cost-effective markets for buying and selling agricultural products. These challenges arise due to fragmented market information, lack of real-time price visibility, and limited access to reliable data across different regions. Traditional methods of price discovery rely heavily on local market knowledge or intermediaries, which can lead to inefficient decision-making, reduced profits for farmers, and increased costs for buyers. As a result, price disparities across markets remain underutilized, and opportunities for agricultural arbitrage are often missed. To address these issues, this project proposes an Agri Arbitrage Finder, a smart web-based system designed to provide real-time insights into agricultural product pricing across multiple markets. The primary objective of this system is to enable users to identify the most economical locations to purchase agricultural commodities by analyzing live market data. By leveraging technology, the system aims to bridge the information gap between different agricultural markets and promote efficient trading practices. The proposed system collects real-time data related to agricultural products, including prices, availability, demand trends, and geographical location of markets. This data is sourced through APIs, web scraping techniques, or integration with agricultural data platforms. The collected data is processed and structured to ensure consistency and accuracy. By continuously updating this information, the system maintains a dynamic and reliable dataset that reflects current market conditions. At the core of the system lies a data analysis engine that compares prices of the same agricultural product across different regions. Using algorithms and filtering techniques, the system identifies locations where products are available at lower prices and highlights potential arbitrage opportunities. Users can view detailed comparisons, including price differences, transportation considerations, and estimated profit margins. This enables traders and buyers to make informed decisions based on real-time insights rather than assumptions. The system is developed using the MERN stack, which includes MongoDB for database management, Express.js and Node.js for backend services, and React.js for building an interactive and responsive user interface. This technology stack ensures scalability, fast data processing, and seamless user experience. The frontend provides intuitive dashboards, search functionalities, and visual representations of price variations, allowing users to easily interpret complex data. In addition to price comparison, the system offers features such as location-based filtering, product categorization, and trend analysis. Users can track historical price patterns, understand seasonal fluctuations, and plan their purchasing strategies accordingly. The platform may also include alerts and notifications to inform users about significant price drops or emerging arbitrage opportunities in specific markets. Furthermore, the system contributes to improving transparency in the agricultural supply chain by reducing dependency on intermediaries and providing direct access to market data. It empowers farmers to identify better selling markets and helps buyers source products at optimal prices. By promoting informed decision-making, the system supports economic efficiency and enhances profitability for all stakeholders involved. The Agri Arbitrage Finder demonstrates how real-time data processing and modern web technologies can transform traditional agricultural trading practices. By integrating data collection, analysis, and visualization into a single platform, the system simplifies complex market dynamics and makes them accessible to users with varying levels of technical expertise. In conclusion, this project serves as an innovative solution for optimizing agricultural trade through data-driven insights. By identifying price differences across markets and enabling users to act on these opportunities, the system enhances market efficiency and reduces cost disparities. Ultimately, it supports better resource utilization, increased profitability, and a more transparent and connected agricultural ecosystem.

Keywords: Agri Arbitrage, Real-Time Market Data, Agricultural Price Comparison, Market Intelligence System, Supply Chain Optimization, Price Difference Analysis, MERN Stack Application, Smart Trading Platform, Data Analytics in Agriculture, Profit Maximization

Paper Id: A570

DECENTRALIZED DETECTION OF NEURODEVELOPMENTAL DISORDERS USING FEDERATED BERT-LORA: A PRIVACY-FIRST APPROACH

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ABSTRACT

Neurodevelopmental disorders present a problematic diagnosis terrain, as a result of the extremely fragile cross-over of the symptoms with the other psychiatric categories. One of the largest obstacles to early diagnosis is the unavailability of diagnostic tools and strict standards of information protection in under-supplied areas. There is a necessity of an automated, privacy-saving mechanism for detecting multiple mental health conditions of neurodevelopmental disorder such as trauma disorder, or mood-induced disorder and provide a clear, explainable clinical reason. The Federated Learning (FL) framework aims at the identification of various mental disorders. The structure relies on a backbone constructed on the basis of BERT with Low Rank Adaptation (LoRA), to enable fine-tuning when the parameter-efficiency should be attained between the decentralized network of hospitals. To deal with the problems associated with the clinical black box, the model employs Hybrid Tri-Head Attention mechanism, namely, the Clinical Head that identifies the symptomatic stimuli, the Social head which acquires the demographic information, and the Structural head that solves the environmental parameters. All of these provide an Evidence Chain to justify each prediction. Specifically, the architecture is designed in such a way that, it looks at the Logic Triggers from the contextual patient profiles and relates a particular symptom to the development stages of a person and the environment stressors. It has been experimented on decentralized clinical data and has demonstrated robust diagnostic performance in the determination of multiple mental states and distinguishing healthy control states. The outcome of the experimental behavior has high diagnostic reliability of over 97.1% of AI confidence score. The proposed model establishes a firm foundation of computerized clinical decision assistance, by bridging the gap between diagnostic accuracy and clinical interpretability.

Keywords: Neurodevelopmental disorders, BERT-LoRA, Federated Learning, Tri-Head Attention, Fine-tuning, Decentralized data.

Paper Id: A571

Privacy Preserving Stroke Risk Prediction Using Federated Deep Learning And Explainable AI

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Abstract

Stroke diagnosis in emergency settings requires timely and accurate assessment, as delayed intervention may lead to severe neurological consequences. Computed tomography (CT) imaging is widely used for initial stroke evaluation due to its rapid availability; however, interpreting CT scans under time pressure remains challenging. Although deep learning models have shown promising results in medical image classification, their deployment across multiple hospitals is restricted by concerns related to patient data privacy and limited model transparency. To address these issues, this study introduces FedXAI-StrokeCNN, a federated deep learning framework designed for privacy-aware and interpretable stroke detection. Instead of aggregating sensitive patient data in a centralized repository, the proposed system enables participating hospitals to collaboratively train a global convolutional neural network while retaining all imaging data locally. To improve robustness under heterogeneous clinical data distributions, a FedProx-based optimization strategy is incorporated. In addition, Grad-CAM is integrated at the client level to provide visual explanations highlighting regions that influence stroke predictions. Experimental results obtained in a distributed setting demonstrate that the proposed approach achieves reliable classification performance while preserving privacy and enhancing interpretability. The framework offers a practical solution for secure and trustworthy multi-institutional stroke diagnosis.

Keywords: Stroke Diagnosis, Federated Learning, Privacy-Preserving Medical AI, Explainable Deep Learning, Computed Tomography Imaging, Clinical Decision Support.

Paper Id: A572

Design of Wearable/Conformal Antenna in mm-Wave Frequency Range

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Abstract

Sports, healthcare, and everyday wearable applications all benefit from the widespread use of wearable antennas. Due to the rapid growth of 5G and the expected development of 6G communication systems, designing wearable devices for millimeter-wave frequencies has become important. To ensure human safety and reduce electromagnetic exposure, these devices should also maintain low SAR(Specific Absorption Rate) values. With the global shift toward 5G and early 6G platforms, millimeter-wave (mm-Wave) technology has become an essential component of modern systems due to the growing reliance on high-speed wireless communication. mm-Wave bands, which operate between 30 and 300 GHz, present design challenges due to their high propagation loss, sensitivity to body proximity, and stringent material requirements. However, they also enable extremely fast data transmission. The design and preliminary investigation of a wearable or conventional antenna that is adaptable and effective in the mm-Wave range are the primary focuses of this project. In the first phase of the project, an extensive literature review was conducted to understand current advancements in wearable antennas, substrate materials, and Multiple-Input Multiple-Output (MIMO) configurations that enhance performance in high-frequency environments. Special attention was given to dielectric behavior at mm-Wave frequencies and techniques used to maintain stable radiation characteristics when the antenna is in close contact with the human body. Rogers RT/duroid 5880 substrate was selected because it exhibits excellent performance at millimeter-wave frequencies and is highly suitable for wearable antenna applications due to its low dielectric loss and flexible material properties.

Keywords—MIMO, mm-Wave, SAR, 5G, 6G

Paper Id: A573

DESIGN AND SIMULATION OF HIGH-GAIN DC–DC BOOST CONVERTER FOR RENEWABLE ENERGY APPLICATIONS

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Abstract

Renewable Energy Systems (RES) such as solar and wind are increasingly adopted due to their sustainability and low environmental impact; however, their inherently low and fluctuating output voltage limits direct utilization in modern power applications. Conventional boost converters often fail to provide sufficiently high voltage gain without operating at extreme duty cycles, leading to increased losses, voltage stress, and reduced efficiency. To address this challenge, this project presents the design and analysis of a novel high-gain boost converter capable of effectively stepping up low renewable energy input to a high, stable DC output. The proposed converter architecture enhances voltage gain while minimizing switching stress and power losses, thereby improving overall system efficiency and reliability. Detailed analysis demonstrates that the converter efficiently boosts renewable energy power to meet the demands of high-voltage loads, making it well suited for practical RES applications such as grid interfacing, energy storage systems, and electric power conditioning units.

Keywords: Renewable Energy Systems, High-Gain Boost Converter, Voltage Gain, Efficiency, Grid Integration.

Paper Id: A574

IOT ENABLED SMART SHOE NAVIGATION SYSTEM FOR THE VISUALLY IMPAIRED

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Abstract

An IOT-enabled smart shoe navigation system is an assistive technology designed to help individuals with visual impairments navigate their surroundings effectively using wearable technology. Many people affected by visual disabilities often face challenges in independent mobility, obstacle detection, and safe navigation, even though they rely on other senses such as touch and hearing. This project proposes a system that detects obstacles and provides navigation assistance through a smart shoe integrated with sensors and IOT-based communication. The system uses ultrasonic sensors and other proximity detection modules to identify obstacles in the user's path, these sensors continuously monitor the surrounding environment and detect objects at various distances, the collected data is processed using a microcontroller, which then alerts the user through vibration or audio feedback, enabling them to take appropriate actions. Additionally, the IOT component allows the system to connect with a mobile application or cloud platform for features such as GPS tracking, emergency alerts, and route guidance, by mapping sensor inputs to intuitive feedback signals, the smart shoe enables users to move safely without relying entirely on external assistance. The proposed solution is designed to be cost-effective, lightweight, and easy to use, making it suitable for daily wear. By enhancing mobility and ensuring safer navigation, the IOT-enabled smart shoe system significantly improves the independence, confidence, and quality of life of visually impaired individuals....

Keywords: IOT (Internet of Things), Smart Shoe, Navigation System, Visually Impaired, Assistive Technology, Obstacle Detection, Ultrasonic Sensors

Paper Id: A575

Coverage Enhancement in a Terahertz Communication System using RIS

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Abstract

Terahertz communication is an essential enabling technology for future 6G wireless communication, but its ultra-high communication rates are obstructed by its high path losses and limited communication ranges. Reconfigurable Intelligent Surfaces (RIS), after their emergence, can be a promising technology to cope with the challenges imposed by high-pathlosses, thereby intelligently controlling the propagation environment. RIS is going to be the key enabler of 6G communication. RIS used to control electromagnetic wave propagation by modifying surface element geometry, spacing, or material composition. RIS can manage signal absorption, refraction, and reflection. This makes the diagnosis of beamforming, signal steering, and interference mitigation in wireless communication certainly possible. In this paper, a simulation study on the effect of RIS-assisted Terahertz communication systems on the coverage aspect of the communication technology will be performed. For the model, a simplified Terahertz communication model comprising THZ communication, Reconfigurable Intelligent Surfaces, and the communication user will be employed, using the Friis model for the simulation, assuming ideal phase synchronization. From the simulation, the signal-to-noise ratio for direct communication, considering RIS assistance, will be larger by several orders of magnitude, hence proving the viability of the technology in extending the communication coverage distance by several orders of magnitude, confirming the fast signal intensity ratio increase proportional to the square of the number of Reconfigurable Intelligent Surfaces.

Keywords—THz, RIS, SNR, 6G

Paper Id: A576

Cloud-Connected Smart Wearable Helmet for Industrial and Mining Worker Safety

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Abstract

Industrial and mining environments represent some of the most hazardous occupational settings worldwide, subjecting workers to toxic and combustible gas accumulations (carbon monoxide, methane, hydrogen sulfide, LPG), oxygen-deficient confined spaces, extreme ambient temperatures and humidity levels, and the ever-present danger of structural collapses and accidental falls in poorly ventilated underground workspaces. Conventional personal protective equipment provides only passive mechanical protection and is entirely incapable of real-time environmental monitoring, physiological surveillance, location tracking, or automated emergency notification, resulting in dangerously delayed hazard detection and hundreds of preventable occupational fatalities annually in the mining and industrial sectors. Existing smart helmet prototypes address individual sensing modalities in isolation but no prior low-cost wearable simultaneously integrates all eight evaluated safety capability dimensions: environmental sensing, physiological monitoring, GPS tracking, automated GSM alerting, cloud dashboard streaming, local OLED display, auditory warning, and manual SOS override. This integration gap leaves deployed workers without comprehensive protection across the full spectrum of identified occupational hazards. This work presents the complete design, hardware implementation, and experimental validation of a Cloud-Connected Smart Wearable Helmet for Industrial and Mining Worker Safety, with the objective of developing a single, helmet-integrated, low-cost platform that simultaneously addresses four compounding occupational safety failure modes: spatial monitoring dead zones, emergency communication latency, physiological invisibility, and emergency location ambiguity. The proposed system employs an STM32F ARM Cortex-M4 microcontroller integrating an MQ-2 metal oxide semiconductor gas sensor, a DHT11 digital temperature and humidity sensor, a MAX30102 photoplethysmographic heart rate and SpO₂ sensor, and a GPS module for real-time worker location tracking. Emergency alerts are dispatched via a GSM module (SIM800/SIM900) as structured SMS messages with GPS coordinates followed by automated voice calls. Sensor data is displayed on a 0.96-inch SSD1306 OLED display mounted within the helmet and streamed to a cloud monitoring dashboard via Wi-Fi at 10-second intervals. Hardware prototype evaluation demonstrated 100% SMS alert delivery with mean end-to-end latency of 8.3 seconds, reliable gas detection at 200 PPM within 3–5 seconds, GPS positional accuracy of 4.7 metres mean error, MAX30102 SpO₂ accuracy of $\pm 1.3\%$ against a certified clinical reference, stable cloud streaming at 10-second intervals across 4-hour endurance sessions, and an estimated battery life of 13+ hours per charge cycle. At Rs. 2,690 per unit (approx. USD 32), the proposed system is 6–30 $\times$ less expensive than commercially available industrial IoT safety wearables, enabling economically viable fleet-scale deployment for mining companies, construction contractors, oil-and-gas operators, and industrial facilities. The 0.96-inch SSD1306 OLED display provides 60% lower power consumption and superior readability in low-light underground environments compared to conventional LCD modules. The modular sensor architecture supports component-level replacement and deployment-specific threshold configuration without firmware recompilation.

Keywords — Smart wearable helmet, IoT worker safety, MQ-2 gas sensor, MAX30102 SpO₂, STM32F microcontroller, GSM emergency alert, GPS tracking, OLED display, cloud monitoring, occupational safety.

Paper Id: A577

Eco-Friendly Sanitary Waste Management System

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ABSTRACT : In India, over 432 million sanitary napkins and diapers are disposed of without any scientific treatment, resulting in soil pollution, groundwater pollution, and a large landfill burden. This is a major environmental and health hazard. The current available technologies, which include open burning, manual disposal, and simple incineration, are unable to control emissions and provide proper hygienic care. The Eco-Friendly Sanitary Waste Management System, as discussed in the paper, is a stainless-steel automatic incinerator with a capacity for burning 20 sanitary napkins or diapers at a time in less than five minutes, with a maximum temperature of 190°C. The system includes a nichrome electrical heating coil, a digital temperature controller with automatic relay cut-off, and a four-layer sequential gas filtration stack using calcium carbonate (CaCO_3), activated carbon, sodium bicarbonate (NaHCO_3), and a HEPA filter with a 99.97% efficiency rating. Components of IoT-integrated monitoring system: Audio playback-guided alert system, LCD display for real-time output, IR proximity sensor-based human detection system for touch-free sanitizer dispenser, real-time monitoring of smoke quality using MQ-2 gas sensor. Emissions have been found to be reduced by more than 96% with respect to CO, while SO_2 , Cl_2 , and dioxins have been completely neutralized using filtration. A circular economy of wastes is created by using incinerated ash as a component of fly ash cement.

Keywords - Sanitary waste incineration, Gas filtration, MQ-2 smoke sensor, IR proximity sensor, IoT monitoring, Temperature controller, Voice alert system.

Paper id: A578

Design & Optimization Of Low Power 4-Bit ALU Using CMOS Technology

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ABSTRACT

This paper presents the design and simulation of an Arithmetic Logic Unit (ALU) using the Cadence tool, with an existing 4-bit ALU and a proposed 8-bit ALU architecture. The ALU performs arithmetic operations such as addition and subtraction, and logical operations including AND, OR, XOR, and XNOR. The design employs combinational logic components such as adders, multiplexers, logic gates, and code converters, along with control logic for operation selection. Carry-out and overflow flags are generated to ensure correct arithmetic functionality. Functional verification and timing analysis are carried out using Cadence simulation tools to validate the correctness and reliability of the design. The performance evaluation is carried out in terms of area, power consumption, and propagation delay. The existing 4-bit ALU occupies an area of $1,250 \mu\text{m}^2$, consumes $18.6 \mu\text{W}$ of power, and exhibits a propagation delay of 2.15 ns . In comparison, the proposed 8-bit ALU requires $2,450 \mu\text{m}^2$ of area, consumes $34.2 \mu\text{W}$ of power, and has a delay of 3.98 ns . Although the proposed design shows an increase in area and power due to higher bit width, it provides enhanced computational capability with acceptable delay performance. These results demonstrate that the proposed 8-bit ALU achieves a balanced trade-off between cost and performance, making it suitable for higher-precision digital processing applications.

Paper id: A579

SOLAR POWERED AUTO IRRIGATION SYSTEM

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Abstract

Solar-powered automatic irrigation systems really take the guesswork out of watering cashew groves—especially in places where water’s scarce and summers get brutal. Too much sun burns and drops flowers, even when farmers try their best to keep up with daily watering using electric pumps. That’s where this solution steps in: a cost-effective setup that runs on solar power, cuts the electricity bill entirely, and uses sensors to make sure every tree gets exactly what it needs. Here’s how the system works. Photovoltaic panels—usually between 100 and 500 watts—hook up with charge controllers and lithium batteries to keep everything running smoothly. Instead of having one big brain, the setup relies on a network of microcontroller nodes (think Raspberry Pi or Arduino) spread across the grove. Each tree gets a soil moisture sensor buried deep near its roots, calibrated for cashews so it spots when things start drying out. Infrared thermometers track canopy and flower temperatures, catching signs of heat stress early—when the temperature gets about 4-5°C above ambient, flowers start to shed. Humidity sensors (DHT22s) keep an eye on the air, and if it drops below 60%, the system gives a heads-up. Rain sensors add a bonus: they stop watering when nature does the job. All these sensors chat through WiFi modules, using MQTT protocol, so data pushes straight to mobile dashboards on apps like ThingSpeak or Blynk. When any sensor spots trouble, a 12V DC pump kicks on, sending water through drip emitters (around 2-4 liters per hour per tree). The water’s stored in a raised tank, so gravity helps with flow—no need for high-pressure lines. The firmware’s smart too, using tricks like moisture hysteresis and scheduling irrigations at dawn and dusk to cut evaporation. Compared to the old flood method, it saves 30-50% of water, and that’s for groves with anywhere from 50 to hundreds of trees. A master Raspberry Pi helps direct subnetworks, zoning watering as needed.

There’s some simple AI here too. Using machine learning models (like scikit-learn), it learns from past data and brings in weather forecasts to predict when stress is likely. If there’s a problem, alerts shoot out instantly via email or SMS. The whole thing costs about \$1-2 per tree up front—panels, sensors, pumps, all included—and there’s nothing to pay for energy afterward. Farmers usually see their investment back within a couple of growing seasons, with yield boosts of 20-30% just from keeping more flowers alive. The system isn’t just good for the wallet. By running off-grid and avoiding excess groundwater use, it cuts carbon emissions by about 500kWh a year for every 100 trees, preserves biodiversity, and fits right in with sustainable development goals. Real-world trials in tropical orchards have already shown flower retention jumps by 15-25%. Down the line, upgrades could include hyperspectral cameras for spotting nutrient problems and even blockchain for trading water credits. It’s a solid step toward climate-resilient cashew farming, not just in India, but anywhere growers face harsh, dry conditions.

Key words: Solar-powered irrigation, precision agriculture, cashew cultivation, soil moisture sensing, infrared thermometry, IoT networks, Raspberry Pi, machine learning prediction, drip irrigation automation, climate-resilient farming

Paper Id: A580

Socio-Economic Determinants of e-Learning Access in Tribal Communities of Jharkhand

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Abstract

The term "e-learning" refers to a teaching and learning approach that uses electronic media, particularly the Internet. E-learning has become an essential tool for maintaining educational continuity, particularly during and after the COVID-19 pandemic. However, socioeconomic groups continue to have unequal access to it, particularly among tribal people in remote, rural areas of Jharkhand. This study looks at the socioeconomic aspects influencing tribal people's access to e-learning in remote and rural parts of the state. Economic status, parents' educational backgrounds, digital infrastructure, gender disparities, language barriers, and geographic isolation are examined in the study using a mixed-method approach. The findings show that access to digital gadgets and internet connectivity is severely restricted by poverty and low household income. The digital gap is made worse by inadequate infrastructure, such as insufficient internet networks and inadequate electrical supplies. The efficacy of e-learning programs is further diminished by linguistic variety and the lack of locally relevant digital information. Systemic socioeconomic issues cause inequities to continue despite government initiatives like Gyanodaya and digital classrooms. The study emphasizes the urgency of inclusive policies that address socioeconomic and technological barriers. It suggests focused initiatives such as the creation of multilingual e-learning resources, community-based digital centres, subsidized digital devices, and awareness campaigns. Addressing these disparities in Jharkhand's tribal regions is essential for ensuring equitable access to education and achieving sustainable development goals.

Keywords

e-learning, Digital divide, Tribal education, Socio-economic determinants, Jharkhand, Educational inequality.

Paper Id: A581

Loneliness in Aging Population: A Tri-Method Review Analysis to Understand the Multidimensional Impact

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Abstract

Loneliness is an emerging public health crisis among India's rapidly aging population, transitioning from traditional joint family systems to nuclear structures. While the psychological impacts are well-documented, the economic costs ranging from increased healthcare utilization to caregiver burden remain under explored in the Indian context. This systematic review assesses India's readiness to address the economic cost of loneliness among older adults by synthesizing evidence on the prevalence, health outcomes, and intervention effectiveness. A tri-methodology design was employed, combining a Systematic Literature Review (SLR) guided by PRISMA 2020, Content Analysis using the TCMADO (Theories, Context, Methods, Antecedents, Decisions, Outcomes) framework, and Bibliometric Analysis. A search of electronic databases (PubMed, ScienceDirect, etc.) for studies published between 2019 and 2025 yielded 102 materials. Findings indicate a high prevalence of loneliness (18%-55%) in India, significantly linked to depression, frailty, and increased risk of institutionalization. The economic readiness is hindered by underdeveloped geriatric infrastructure and a lack of specific policy frameworks targeting loneliness-related costs. However, emerging digital and AI-based interventions show promise in mitigating these impacts. India requires a robust economic strategy that integrates technological solutions with community-based care to mitigate the rising societal and healthcare costs of loneliness.

Keywords: Loneliness, elderly population, Socio-economic condition, cost.

Paper Id: A582

A TinyML Augmented Inertial Navigation System for Real-Time Drift Compensation on an STM32 Microcontroller

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Abstract

Low-cost MEMS-based Inertial Navigation Systems (INS) suffer from nonlinear and time-varying gyroscope bias drift, leading to cumulative orientation errors in long-duration applications. Traditional sensor fusion algorithms assume constant bias and fail to compensate for dynamic drift behavior under real operating conditions. This paper presents a TinyML-augmented inertial navigation system implemented on an STM32 microcontroller for real-time adaptive drift compensation. A lightweight neural network model is trained using temporal gyroscope features and deployed using TensorFlow Lite Micro with 8-bit quantization. The estimated bias is removed prior to quaternion-based Madgwick sensor fusion. Experimental validation demonstrates reduced cumulative drift, improved yaw stability, and real-time execution feasibility within strict embedded memory constraints. The proposed approach validates the integration of embedded machine learning in aerospace navigation systems.

Keywords: TinyML, Inertial Navigation System, Gyroscope Drift, STM32, Embedded Machine Learning.

Paper Id: A583

Influencer Marketing as a Determinant of Brand promotion in the Digital Marketing Era- A Conceptual Study

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Abstract

Influencer marketing has emerged as an important digital marketing strategy for promoting brands in today's business environment. Social media apps such as Instagram, YouTube, and Facebook have grown rapidly, giving influencers significant power over what people think and buy. Influencer marketing is when brands collaborate with popular online personalities who can influence their followers. Influencers promote products or services by sharing reviews, recommendations, and sponsored posts with their followers. This study explores influencer marketing as an effective strategy for brand promotion by using secondary data collected from journals, books, and various online sources. The research emphasizes the significance, advantages, and challenges associated with influencer marketing in the digital marketing environment. The study shows that influencer marketing plays a crucial role in enhancing brand awareness, increasing consumer engagement, and influencing consumers' purchase intentions.

Keywords: Influencer Marketing; Brand Promotion; Social Media Marketing; Digital Marketing

Paper Id: A584

An Intelligent Ai Framework For Real-Time Sensitive Data Leakage Detection And Prevention In Multi-Cloud System

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ABSTRACT

An intelligent Artificial Intelligence (AI)-driven framework for the real-time detection and prevention of sensitive data leakage in integrated multi-cloud environments, addressing the growing challenges of data security, heterogeneity, and cross-platform monitoring. With the increasing adoption of multi-cloud architectures, traditional rule-based security mechanisms fail to effectively detect complex and evolving leakage patterns due to their static nature and lack of adaptability. The proposed system leverages advanced machine learning and deep learning techniques to analyze large-scale cloud activity logs, user behavior patterns, and data access events in real time. Specifically, three complementary models—Random Forest (RF), Support Vector Machine (SVM), and Long Short-Term Memory (LSTM)—are employed to capture diverse characteristics of data leakage. Random Forest efficiently handles high-dimensional log data and identifies feature importance, SVM provides robust boundary-based classification for detecting subtle anomalies, and LSTM captures temporal dependencies to identify sequential and evolving leakage behaviors. To enhance detection performance, a hybrid ensemble model is developed by integrating the predictions of these individual models using a fusion strategy. This ensemble approach exploits the strengths of each algorithm, resulting in improved accuracy, reduced false positives, and better generalization across heterogeneous cloud platforms. Additionally, the framework incorporates cross-cloud event correlation and intelligent data classification mechanisms to detect leakage without exposing sensitive raw data, thereby preserving privacy. The system is designed to operate in real time, providing continuous monitoring, automated alert generation, and an interactive dashboard for security administrators. Experimental evaluation demonstrates that the proposed hybrid model significantly outperforms traditional rule-based systems and standalone machine learning models in terms of accuracy, precision, recall, and F1-score. Overall, this framework offers a scalable, adaptive, and efficient solution for securing sensitive data in modern multi-cloud infrastructures, with potential applications in enterprise security, financial systems, healthcare data protection, and government cloud services..

Keyword: Support Vector Machine (SVM), Long Short-Term Memory (LSTM), Data Loss Prevention (DLP).

Paper Id: A585

Comparative Study of Time Domain and Morphological Features of PPG Signals for Age-Related Cardiovascular Analysis

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Abstract

Photoplethysmography (PPG)–based wearables are gaining importance because of their ability to non-invasively measure physiological parameters such as heart rate and oxygen saturation in real time. This study analyses PPG signals to quantitatively evaluate the importance of time-domain and morphological features across diverse age groups, representing heart rate variability (HRV) and pulse waveform characteristics. Subjects below 30 years of age were classified as young, and those above 50 years of age were classified as old. In this work, time-domain analysis is chosen due to its suitability for real-time monitoring applications. Age-based variations and feature relationships are identified using statistical analysis, including correlation analysis and principal component analysis (PCA). Temporal features demonstrate higher sensitivity to the variations in cardiovascular parameters across age groups than morphological features. Particularly, the mean RR interval, rise time, and pulse width are observed to have stronger associations with age. An SVM-based classification model achieved a balanced accuracy of 80% with optimized feature selection and clearly separated age groups. These results further highlight the effectiveness of temporal PPG features over morphological features in the study of age-based cardiovascular changes.

Keywords: PPG, temporal features, morphological features, age groups, cardiovascular parameters, SVM

Paper Id: A586

SUSTAINABLE AI ENERGY MANAGEMENT FOR SMART HOMES WITH PV INVERTERS AND BATTERY HEALTH OPTIMIZATION

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Abstract

The current energy management landscape faces significant challenges due to the increasing complexity of integrating renewable energy sources, particularly photovoltaic (PV) systems, with traditional power grids. Conventional systems lack real-time monitoring capabilities, leading to inefficient energy utilization, delayed fault detection, and increased operational costs. They also rely on reactive maintenance strategies, where issues such as battery degradation or inverter faults are identified only after performance declines, resulting in unexpected failures and reduced system reliability. Additionally, the absence of intelligent energy optimization leads to improper utilization of solar energy and increased dependence on grid power. To address these challenges, the proposed solution introduces an IoT-based Energy Management System (EMS) integrated with Predictive Maintenance using Adaptive Algorithms (PM-AA). The system enables continuous real-time monitoring of key components such as PV inverters, battery storage, and load consumption through IoT sensors. By analyzing historical and real-time data, adaptive algorithms predict potential failures in advance, enabling proactive maintenance and reducing downtime. Furthermore, unit cost analysis ensures efficient energy distribution by balancing self-consumption, battery usage, and grid interaction. Overall, the system improves efficiency, reliability, and supports sustainable energy management.

Keywords: IoT, Energy Management System (EMS), Predictive Maintenance, Adaptive Algorithms, Smart Grid, Real-Time Monitoring, Energy Optimization, Data Analytics, Fault Prediction, Battery Management.

PAPER ID: A587

Multimodal Machine Learning for House Price Prediction with Geo-Spatial Embedding

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Abstract

The rapid growth of real estate markets has increased the demand for accurate and intelligent house price prediction systems. Traditional methods rely primarily on structured data such as property size, number of rooms, and location, which often fail to capture the complex factors influencing property values. This project proposes a multimodal deep learning framework that integrates heterogeneous data sources, including structured property data, geo-spatial information, and contextual features, to enhance prediction accuracy. The proposed system utilizes geo-spatial embedding techniques to model the spatial relationships between properties and nearby amenities such as schools, hospitals, transportation hubs, and commercial areas. These embeddings capture the influence of neighbourhood characteristics on property prices. Additionally, the model incorporates multiple data modalities, including numerical features, geographic coordinates, and optionally image or textual data, enabling a more comprehensive understanding of real estate dynamics. A deep learning architecture, such as a combination of neural networks and embedding layers, is employed to learn complex nonlinear relationships between features. The model is trained and evaluated using real-world datasets, demonstrating improved performance compared to traditional machine learning approaches like linear regression and random forest. The results show that integrating multimodal data and geo-spatial embeddings significantly enhances prediction accuracy, making the system suitable for real-world applications in real estate analytics, smart city planning, and investment decision-making. This approach highlights the importance of combining spatial intelligence with deep learning to build robust and scalable property valuation models.

Keywords: Multimodal Learning, Deep Learning, House Price Prediction, Geo-Spatial Embedding, Neural Networks, Real Estate Analytics.

Paper Id: A588

SMART ENERGY AND WATER RESOURCE CONVERSION SYSTEM USING IOT AND AI

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Abstract

Efficient utilization of electricity and water resources is essential for sustainable development and smart living. This work presents a Smart Energy Meter and Water Management System, an Internet of Things (IoT)-based solution that integrates energy and water monitoring into a unified platform. The system utilizes an ESP32 microcontroller interfaced with voltage and current sensors for measuring electrical consumption, along with water flow and water level sensors for tracking water usage and tank status. These sensors collect real-time data, which is processed and transmitted via Wi-Fi to a cloud-based or local web interface for visualization and analysis. The system enables users to monitor daily, weekly, and monthly consumption patterns remotely, allowing better control and awareness of resource usage. Intelligent alert mechanisms are incorporated to notify users in case of abnormal conditions such as excessive energy consumption or water leakage. This integrated approach reduces system complexity while improving monitoring efficiency and accessibility. The proposed solution is cost-effective, scalable, and suitable for residential and small-scale industrial applications. It promotes sustainable resource management by providing real-time insights and automated alerts. Future enhancements may include motion-based automation, predictive analytics using machine learning, mobile application integration, and large-scale deployment for smart city applications.

Keywords: Internet of Things (IoT), Artificial Intelligence (AI), Smart Energy Monitoring, Water Resource Management, Real-Time Monitoring, Automation, Smart Utility System, Energy Efficiency.

Paper Id: A589

Biofertilizers from cyanobacteria or mycorrhizae: Eco-friendly replacements for NPK fertilizers.

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Abstract

The whole world is depended on the NPK Fertilizers i.e. Nitrogen, Phosphorous and Potassium. Use of this NPK Fertilizers increased the agricultural yield, but in turn it is affecting our environment also. This is the study of the use of biofertilizers which are derived from the cyanobacteria and mycorrhizae which are not harmful and they don't affect the environment too so they can be eco-friendly. Since they do not affect the environment, NPK Fertilizers can be replaced by the biofertilizers. As we know that cyanobacteria help in Nitrogen fixing and mycorrhizae improves the phosphorous level. By using both the soil health or soil fertility also gets high or increased. And they also increase the plant growth because of the presence of phosphorous. This paper talks about the advantages of Biofertilizers, how it works well compared to the NPK Fertilizers, how it increases the crop productivity and how to apply this in the field.

Keywords: Biofertilizer, NPK Fertilizers, Cyanobacteria, Mycorrhizae, Nitrogen fixation, soil fertility or soil health and Eco-Friendly

Paper Id: A590

DROWSINESS DETECTION SYSTEM USING EYE ASPECT RATIO TECHNIQUE

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Abstract

Driver drowsiness is a major cause of road accidents, affecting reaction time, awareness, and driving performance. Existing detection methods, such as steering behavior analysis and physiological monitoring, are often unreliable, intrusive, or costly, and struggle to differentiate between normal blinking and prolonged eye closure. This paper presents a real-time, non-intrusive driver drowsiness detection system using the Eye Aspect Ratio (EAR) combined with a Continuous Monitoring and Measurement (CMM) algorithm. A camera captures facial video, and computer vision techniques extract facial landmarks to analyze eye movements. The EAR is calculated using geometric relationships between eye points, where a drop below a threshold indicates eye closure. The CMM algorithm improves accuracy by analyzing EAR values over consecutive frames, distinguishing normal blinking from drowsiness. Additionally, adaptive thresholding is incorporated to handle variations in lighting conditions and individual differences among drivers. The system also supports real-time performance optimization for low-power embedded platforms. Upon detection, the system triggers audio and visual alerts to warn the driver. The system is implemented using Python with OpenCV, Dlib, and NumPy, and can run on embedded platforms like Raspberry Pi. IoT integration enables cloud-based monitoring and data logging. The proposed system is efficient, cost-effective, and enhances driver safety while supporting intelligent transportation systems.

Keywords: Driver Drowsiness Detection, Computer Vision, Eye Aspect Ratio (EAR), Continuous Monitoring Algorithm, Real-Time Systems, Facial Landmark Detection, OpenCV, IoT Integration, Embedded Systems, Intelligent Transportation Systems.

Paper Id: A591

DEVELOPMENT OF IOT BASED FISH MONITORING SYSTEM FOR AQUACULTURE

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Abstract

Aquaculture is an essential sector contributing to global food production, where maintaining optimal water quality is critical for ensuring fish health and productivity. However, conventional monitoring methods rely on manual sampling and periodic testing, which are time-consuming, less accurate, and incapable of detecting sudden environmental changes, often leading to poor water conditions, fish stress, disease, and economic losses. To address these limitations, this project presents the development of an IoT-based fish monitoring system for aquaculture. The system integrates multiple sensors to measure key water quality parameters such as temperature, pH, and water level. These sensors are interfaced with microcontrollers like ESP8266/ESP32, enabling real-time data acquisition and wireless transmission to cloud platforms such as ThingSpeak, Blynk, or Firebase. The collected data is visualized through a web or mobile dashboard, allowing farmers to monitor pond conditions remotely. Additionally, the system includes an automated alert mechanism that notifies users when any parameter exceeds predefined safe limits, enabling timely corrective actions. The proposed system reduces manual effort, enhances monitoring accuracy, and provides a cost-effective and scalable solution for small and medium-scale fish farms. This project aims to improve fish health, reduce mortality rates, and support sustainable aquaculture practices, with future scope for advanced features such as dissolved oxygen monitoring, automated control systems, and AI-based fish health prediction.

Keywords: IoT, Aquaculture Monitoring, Water Quality Sensors, ESP8266, ESP32, Real-Time Monitoring, Cloud-Based Dashboard, Automated Alerts, Fish Health Management, Sustainable Aquaculture.

Paper Id: A592

IoT BASED SIGN BOARD DETECTION AND ALERTING SYSTEM FOR DRIVERS

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Abstract

Road accidents are a major global concern, often caused by driver inattention and poor visibility. Traffic signs convey critical information, but factors like fog, rain, night driving, damaged signs, and driver fatigue reduce their effectiveness, and existing manual or map-based systems fail to provide real-time assistance, increasing accident risk. This project presents the development of an IoT-based Sign Board Detection and Alerting System for Drivers, designed to enhance road safety through intelligent automation. The proposed system uses a camera mounted on the vehicle to continuously capture real-time road images, which are processed using computer vision and machine learning techniques to detect and classify various traffic signboards such as stop signs, speed limits, school zones, and sharp turns. Once a signboard is detected, the system immediately alerts the driver through audio and visual notifications, enabling quick response and better decision-making. The system also integrates an IoT communication module to transmit detected sign data to a cloud platform, allowing remote monitoring, data storage, and analysis for improved traffic management. The proposed solution is non-intrusive, cost-effective, and suitable for real-time deployment in vehicles. It reduces dependency on driver attention, especially under low-visibility conditions, and improves compliance with traffic rules. By providing timely alerts and leveraging IoT connectivity, this system contributes to safer driving environments and the advancement of intelligent transportation systems.

Keywords: IoT, Traffic Sign Detection, Computer Vision and Machine Learning, Real-Time Alerts, Intelligent Transportation Systems, Driver Assistance and Road Safety, Cloud Monitoring, Embedded Systems

Paper Id: A593

TYPES OF MOTOR USED IN ELECTRIC VEHICLE

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Abstract:

The shift toward electric mobility has turned the electric motor into the heart of the modern powertrain. Unlike internal combustion engines, electric motors provide nearinstantaneous torque, high efficiency, and a simplified mechanical structure. While there are several ways to turn electricity into motion, the EV industry has primarily coalesced around three dominant technologies: Permanent Magnet Synchronous Motors (PMSM), Induction (Asynchronous) Motors (IM), and Switched Reluctance Motors (SRM). The PMSM is currently the most popular choice for EVs, utilized by manufacturers like Tesla (Model 3/Y), Hyundai, and Kia. These motors use powerful permanent magnets—usually made from rare-earth materials like neodymium—embedded in the rotor. How it works: The magnets create a constant magnetic field that "locks" onto the rotating magnetic field of the stator, spinning at the same synchronous speed. Pros: Extremely high efficiency (often >95%) and a high power-to-weight ratio, which is critical for maximizing battery range. Cons: High cost and supply chain volatility due to the use of rare-earth magnets. . Induction (Asynchronous) Motors (IM).Famously championed by Tesla in their early Model S and X units, the induction motor does not rely on permanent magnets. Instead, it uses the principle of electromagnetic induction to "induce" a current in the rotor. How it works: A rotating magnetic field in the stator creates a current in the rotor bars (often called a "squirrel cage"). The rotor then chases the stator's field but always spins slightly slower (the "slip"). Pros: Robust, reliable, and significantly cheaper to produce than PMSM. They are also excellent for highway cruising because they can be "de-energized" to reduce drag when not in use. Cons: Generally less efficient at low speeds and tends to generate more heat, requiring more robust cooling systems. Switched Reluctance Motors (SRM),SRMs are the "rugged" outliers of the EV world. They don't use magnets or copper windings on the rotor; instead, they rely on the property of magnetic reluctance. How it works: The rotor is made of a magnetic material (like steel) with "teeth." The stator coils are switched on and off in sequence, pulling the rotor teeth toward the magnetic field to minimize the gap (reluctance). Pros: Simplest construction and extremely durable at high temperatures. Cons: Historically known for high torque ripple (vibration) and acoustic noise ("whining"), making them more common in heavy-duty commercial EVs than luxury cars.

Paper Id: A594

Machine Learning Driven Knowledge Discovery in Emerging Technological Ecosystems

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Abstract

Machine Learning (ML) has become one of the most influential technological advancements of the modern digital era. It enables intelligent systems to learn patterns from historical data and generate predictive insights that support decision-making and automation. With the rapid growth of big data, Internet of Things (IoT), cloud computing, and digital infrastructures, machine learning plays a critical role in extracting meaningful knowledge from large and complex datasets. The ability of ML algorithms to discover hidden patterns and correlations significantly enhances technological innovation and research capabilities. This paper presents a comprehensive study of the role of machine learning in enhancing knowledge across various technological domains. It discusses machine learning methodologies, system architectures, algorithms, and real-world applications in fields such as healthcare, cybersecurity, smart manufacturing, and intelligent transportation systems. Furthermore, an experimental framework is presented to evaluate the performance of different machine learning models for technological knowledge discovery. The study highlights the advantages, challenges, and future prospects of machine learning-driven technological ecosystems.

Keywords: Machine Learning, Artificial Intelligence, Knowledge Discovery, Predictive Analytics, Deep Learning, Intelligent Systems

Paper Id: A595

An Intelligent Inventory Management System with Sales Prediction Using Machine Learning

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Abstract

Effective inventory management is essential for maintaining business efficiency and customer satisfaction, especially in retail and supply chain environments. However, traditional inventory systems often rely on manual processes and lack the ability to accurately predict future demand, leading to issues such as overstocking, understocking, and increased operational costs. To address these challenges, this paper proposes a Machine Learning Based Inventory Management System with Sales Prediction. The proposed system integrates inventory tracking with data-driven forecasting techniques to improve stock management and decision-making. The system collects and analyzes historical sales data, including product details, quantity sold, and transaction dates, and applies machine learning algorithms such as Linear Regression and Random Forest to predict future sales trends. Based on these predictions, the system provides intelligent stock recommendations to optimize inventory levels and reduce wastage. Additionally, the system includes modules for data preprocessing, inventory monitoring, and visualization of results through reports and charts. Experimental results demonstrate that the proposed system improves forecasting accuracy and enhances operational efficiency by enabling proactive inventory planning. The integration of predictive analytics with inventory management reduces manual effort, minimizes errors, and supports informed decision-making. This approach is particularly beneficial for small and medium-scale enterprises aiming to improve profitability and streamline inventory operations.

Keywords: Inventory Management, Sales Prediction, Machine Learning, Demand Forecasting, Stock Analysis, Business Intelligence, Inventory Optimization, Predictive Analytics

Paper Id : A596

Medical Chatbot LLaMA3

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ABSTRACT

Embracing the knowledge era in healthcare, this research explores a novel medical chatbot empowered by the formidable LLaMA 3 language model. Transcending the limitations of conventional chatbots, it leverages a trifecta of technological prowess: LLaMA 3's vast knowledge base and nuanced understanding of medical language enable pinpoint- accurate responses, even to intricate inquiries. Chainlit's web framework sculpts an intuitive interface, empowering users to effortlessly navigate and visualize pertinent medical information. Faiss, the master of information retrieval, swiftly delivers curated medical resources tailored to the user's specific needs. This research paves the way for a future where medical chatbots, wielding the power of knowledge, empower individuals to navigate the complexities of healthcare with confidence. This research paper introduces a cutting-edge healthcare chatbot that harnesses the synergy of LLaMA3, Faiss, and Hugging Face embeddings to optimize responses to intricate medical inquiries. The integration of LLaMA3 bolsters the chatbot's contextual comprehension, while Faiss enables expedited, similarity-based information retrieval from an extensive library of medical texts. Hugging Face embeddings facilitate contextually coherent response generation. The results affirm substantial enhancements in the chatbot's efficacy in delivering technically informed and contextually best medical responses. This promising innovation offers a powerful tool for disseminating validated medical knowledge, serving as an invaluable resource for healthcare professionals and patients to understand the symptoms by prompting and gives quick aid in emergency.

KEYWORDS: LLaMA3, Medical Chatbot, NLP, LangChain, FAISS, Healthcare AI.

Paper Id: A597

A VLAN-Based Hierarchy Campus Network Framework With Hierarchical EIGRP-Based Routing And Secure Educative Environment

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Abstract

The current learning institutions have several academic blocks and administrative departments that need continuous, secure, and scalable network infrastructure to facilitate the instructional processes, research processes, and the management of such institutions. The stable campus networking has thus been made a necessity. The given research paper is dedicated to design and simulation of a secure multi building school campus network on the basis of use of Cisco Packet Tracer. To improve the optimization, scalability, and fault resilience of traffic, a hierarchical network structure that uses core, distribution, and access layers is used instead of the use of the static routing mechanisms in preference of the Enhanced Interior Gateway Routing Protocol (EIGRP). Virtual Local Area Network (VLAN) configuration is logical segregation of departments such as administration, academic block, laboratories, library, and server environments, which leads to fewer broadcast overheads and enhanced security. Multilayer switching techniques facilitate the inter-department communication and reliability of the network is guaranteed by the dual connection of the Internet Service Providers, which ensures external connectivity at all times when the links are disrupted. Infrastructure services like Dynamic Host Configuration Protocol, Domain Name System, wireless access infrastructure and shared network printing are incorporated to address the needs of the users. The outcomes of simulations indicate that there is end-to-end connectivity with a virtually 98.6% packet delivery accuracy and 99% network availability. The deployed output model attests to effective traffic management, good security checks, and sound operational functionality that can be used on a real-life campus implementation.

Keywords: VLAN, EIGRP, Campus Network, Hierarchical Design, Network Security, Packet Tracer.

Paper Id: A598

Exploring the Relationship between Mindfulness, Psychological Resilience, and Life Satisfaction among adults

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Abstract:

In recent years, researchers have shown growing interest in understanding the factors that influence people's well-being and satisfaction with life. Among these, mindfulness and psychological resilience have been identified as important aspects of positive mental health. The present study explores the relationship between mindfulness, psychological resilience, and life satisfaction among adults. Mindfulness refers to an individual's ability to stay aware of the present moment in a calm and accepting way, while psychological resilience reflects the capacity to cope with difficulties, recover from setbacks, and adjust to challenging situations. The study focuses on examining how mindfulness is related to life satisfaction, how it is associated with resilience, and how resilience, in turn, relates to life satisfaction. It is expected that more mindful individuals will also tend to be more resilient and report higher levels of life satisfaction. Similarly, individuals with greater resilience are likely to experience a stronger sense of contentment and well-being in their daily lives. In today's fast-changing and often stressful environment, these qualities may play an important role in helping individuals manage pressure and maintain emotional balance. Understanding how mindfulness and resilience work together can offer useful insights into how people cope with challenges and maintain a positive outlook on life. These insights are particularly relevant in the context of increasing mental health concerns among adults. They also highlight the importance of developing inner strengths that support long-term well-being. The findings of this study are expected to contribute to existing knowledge by providing a clearer picture of the combined role of mindfulness and resilience in shaping life satisfaction. The study may also have practical relevance for mental health professionals and well-being programs, as it highlights the value of encouraging mindfulness practices and building resilience as ways to support better mental health and improve overall quality of life among adults.

Keywords: Mindfulness, Psychological Resilience, Life Satisfaction, Well-being, Adults

Paper Id: A599

Digital Twin for Realtime Heart Health Monitoring

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Abstract

Digital twins for heart health monitoring create a personalized virtual replica of a patient's heart using real-time data from wearables and other sources to simulate and predict cardiac function and disease risk. Machine learning models analyze incoming health data to detect abnormalities and predict potential heart-related issues with high accuracy.

Paper Id: A600

Design of a Compact Wideband Slotted Hexagonal shaped patch Antenna for 5 mm Wave Communication

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Abstract

This paper presents the design and performance study of a compact wideband slotted hexagonal patch antenna optimized for 5G millimeter-wave (mm-Wave) communication systems. The antenna is built on a FR-4 substrate with a dielectric constant of 4.4 and thickness of 0.8 mm, resulting in a compact size of $6 \times 8 \times 0.8 \text{ mm}^3$. The design has a maximum peak gain of 3.6 dB and a radiation efficiency of 85.6% at the center frequency, indicating that it is suitable for high-frequency operation with little loss. The radiation pattern has consistent directional properties and high polarization purity throughout the band. The suggested five-slotted hexagonal patch antenna is a promising option for next-generation 5G mmWave transceivers, IoT front-end, and tiny wireless communication modules because of its compact geometry, broad bandwidth, and high efficiency.

Keywords : 5G(mm-Wave), Hexagonal antenna, high gain, wideband operation.

Paper Id: A601

Physicochemical study on the Dissociation Constant and Ionization behaviour of Nicotinic acid through Titrimetric analysis

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ABSTRACT

Potentiometric titration using standardised Sodium hydroxide was done to analyse the acid-base behaviour of biologically important carboxylic acid (Nicotinic acid), with a specific significant on estimating the effect of concentration of Sodium chloride, pH variation and temperature on this process. It was planned to find the titration curve and analyse how the ionic strength and thermal conditions affect the observed pH values. A Standard nicotinic acid was made using distilled water and titrated against standardised sodium hydroxide under controlled conditions. This titration was executed by gradual addition of base with continuous stirring, and the pH measured was recorded after each increment using a calibrated digital pH meter. A titration curve (pH vs Volume of NaOH added) was made to determine the buffering region as well as the equivalence point. To Analyse the effect of ionic strength, the same experiment was repeated several times in the presence of Sodium chloride. The NaCl addition alters the ionic environment of the solution, which results in slight variations in the observed pH values throughout the experiment. There is a minor shift in the half-neutralisation points, and the equivalence point pH was observed, which indicates that an increase in the ionic strength influences the proton activity and apparent dissociation behaviour. The temperature effect was analysed by performing titrations at different controlled temperatures. Temperature changes produce measurable differences in pH readings at respective titration points. This procedure confirms that accurate potentiometric analysis of dissociation behaviour requires strict control of experimental conditions, especially the electrolyte concentration and the thermal environment.

Keywords: Nicotinic acid, dissociation constant, ionisation.

Paper Id: A602

INDUSTRIAL CONVEYOR

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Abstract

The Geneva mechanism is a gear mechanism that translates continuous rotation into an intermittent rotary motion. The rotating drive wheel has a pin that reaches into a slot of the driven wheel advancing it by one step. The drive wheel also has a raised circular blocking disc that locks the driven wheel in position between steps. Geneva mechanism has many applications such as in watches, projector, etc. But we used Geneva mechanism for converting rotary motion into an intermittent motion in production line. Geneva mechanism can be used in material handling in an industry. The proposed concept will help in production line where many workers are used for the material handling purpose it also reduce the cost and threshing time requirement of more number of worker will be completely eliminated as only two workers can carried out the complete operation .The analysis highlights the importance of proper material selection, power calculation, and maintenance planning to ensure system reliability, energy efficiency, and longevity. Industrial conveyors remain fundamental to modern production systems, enabling streamlined operations and continuous material flow across industries such as manufacturing, mining, food processing, and logistics. The study also addresses common operational challenges such as belt misalignment, wear and tear, slippage, and maintenance planning.

Keywords: Geneva Mechanism, Intermittent Rotary Motion, Gear Mechanism, Production Line Automation, Material Handling System, Industrial Conveyors.

Paper Id A603

Design and Evaluation of optimising data using adaptive LoRa IoT Network for Direct Satellite Communication using advanced Microcontroller

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Abstract

The increasing reliance on space-based systems for global communication has accelerated the Design and Evaluation of optimising data using adaptive LoRa IoT Network for Direct Satellite Communication using advanced Microcontroller need for scalable and efficient Internet of Things (IoT) architectures in aerospace applications. Low Power Wide Area Networks (LPWAN), particularly LoRa-based systems, offer a promising solution for long-range, low-power communication. When integrated with direct-to-satellite links, these systems enable seamless connectivity for aerospace platforms such as small satellites, high-altitude platforms, and remote sensing missions. However, uplink scalability remains a critical challenge due to limited spectrum availability, high latency, and increased collision probability. This paper presents an enhanced LoRa-based direct-to-satellite IoT network with the integration of a real-time IoT monitoring system tailored for aerospace applications. The proposed system enables continuous data acquisition and live monitoring of parameters such as environmental conditions, payload status, and system health through a web-based interface. Key performance metrics, including packet delivery ratio, latency, network capacity, and energy efficiency, are analyzed under varying operational conditions. To address scalability issues, optimization techniques such as Adaptive Data Rate (ADR), efficient channel allocation, and collision mitigation strategies are implemented. The real-time monitoring capability allows dynamic system evaluation and improved mission reliability, which is critical for aerospace operations. The results demonstrate that the proposed system significantly enhances uplink scalability and communication reliability, making it suitable for applications such as satellite telemetry, CubeSat missions, atmospheric monitoring, and disaster surveillance. This work contributes to the development of robust, scalable, and intelligent IoT communication frameworks for next-generation aerospace systems.

Paper Id A604

FRICITION AND THERMAL ANALYSIS OF AN AIRCRAFT BREAK DISC INCORPORATING RADIAL HOLES

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Abstract

Aircraft brake discs experience extreme thermal loads during aircraft landing, particularly under emergency braking conditions, due to the rapid conversion of kinetic energy into heat through friction. This study presents a thermal investigation of the heat dissipation behavior of an aircraft brake disc structural modifications aimed at improving cooling performance. A three. Dimensional finite element model of the brake disc is developed to analyze transient thermal behavior under realistic braking conditions. The thermal analysis considers frictional heat generation, internal heat conduction, and convective-radiative heat loss to evaluate temperature distribution and them1al gradients across the disc surface. To enhance heat dissipation, radial holes are incorporated into the brake disc design, increasing surface area and promoting improved airflow. The analysis results indicate that the modified brake disc design significantly reduces peak temperature and improves thermal stability compared to a conventional solid disc. The study demonstrates that optimized aircraft brake disc geometry using radial holes provides an effective balance between thermal performance, structural reliability, and braking safety. The proposed design is suitable for high-performance aircraft braking systems where efficient heat dissipation and thermal durability are critical.

Keywords: Aircraft Brake Disc, Carbon-Carbon Composite, Radial Holes, Thermal Analysis, Heat Dissipation, Finite Element Analysis.

PAPER ID: A605

Mechanical Performance Evaluation of Coconut Fiber and Eggshell Powder Reinforced Epoxy Composites for Sustainable Aircraft Structural Applications

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Abstract

In recent years, the development of eco-friendly and sustainable materials has gained significant importance due to increasing environmental concerns and the depletion of conventional resources. Natural fiber reinforced polymer composites have emerged as effective alternatives to synthetic fiber composites because of their low cost, biodegradability, renewability, and acceptable mechanical properties. In this project, an experimental investigation is conducted to study the mechanical behaviour of epoxy-based polymer composites reinforced with coconut fiber and eggshell powder. Coconut fiber is chosen as the primary natural reinforcement due to its good toughness, low density, high lignin content, and renewable nature, which contribute to improved durability and impact resistance of the composite. Eggshell powder, a bio-waste material rich in calcium carbonate, is used as a filler to enhance the stiffness, strength, and interfacial bonding of the epoxy matrix while promoting waste utilization. The composites are fabricated using the hand lay-up method, and different specimens are prepared by varying the weight percentages of coconut fiber and eggshell powder in the epoxy resin. Standard specimens are prepared according to ASTM standards for mechanical testing. Mechanical characterization is carried out through tensile, flexural, impact, and hardness tests to evaluate the performance of the developed composites. The experimental results show that the incorporation of coconut fiber and eggshell powder significantly improves the mechanical properties of epoxy composites, making them suitable for lightweight and nonstructural engineering applications while contributing to sustainable material development.

Keywords: Epoxy Resin, Coconut Fiber, Eggshell Powder, Natural Fiber Composites, Mechanical Properties, Bio-waste Reinforcement, Hand Lay-up Method

Paper Id: A606

AI -DRIVEN REAL TIME TRANSLATION SYSTEM

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Abstract

This project presents an AI-driven real-time translation system designed to facilitate seamless multilingual communication while ensuring high performance and data privacy. Unlike conventional cloud-based translation systems, the proposed framework adopts a local-first architecture, enabling all audio processing, transcription, and translation tasks to be performed directly on the user's device, thereby minimizing latency and eliminating data security risks. The system integrates advanced Digital Signal Processing and Artificial Intelligence techniques, beginning with neural vocal isolation using Demucs to separate speech from background noise, ensuring high-quality input even in noisy environments. The extracted speech is then processed using an efficient Speech-to-Text module, followed by accurate translation through Neural Machine Translation models. A Text-to-Speech component further converts the translated text into natural-sounding audio, enabling smooth real-time interaction. Designed as a cross-platform solution, the system supports applications such as live streaming, subtitle generation, and accessible communication across diverse domains. By addressing key limitations of existing systems, including dependency on internet connectivity, vulnerability to noise, and privacy concerns, the proposed system provides a robust, scalable, and efficient solution for real-time multilingual communication.

Keywords: Artificial Intelligence, Real-Time Translation, Natural Language Processing, Neural Machine Translation, Speech Processing, Privacy-Centric Systems.

Paper Id: A607

Modeling and Analysis of Low Switching Loss SVPWM Inverter and Harmonic Elimination in Electric Vehicles

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Abstract

The rapid growth of electric vehicles (EVs) has increased the demand for efficient power electronic converters with improved performance and reduced losses. This project focuses on the modeling and analysis of a low switching loss Space Vector Pulse Width Modulation (SVPWM) inverter and its role in harmonic elimination for electric vehicle applications. SVPWM is an advanced modulation technique that enhances the utilization of the DC bus voltage and reduces switching losses compared to conventional PWM methods. In this work, a detailed mathematical model of the SVPWM inverter is developed and analysed to optimize switching sequences and minimize power losses. The inverter is designed to efficiently drive electric vehicle motors while ensuring improved energy efficiency and thermal performance. A key objective of this project is the reduction of harmonic distortion in the inverter output. Harmonics in EV drive systems can lead to increased losses, electromagnetic interference, and reduced motor lifespan. Therefore, harmonic elimination techniques are incorporated and evaluated to achieve a near-sinusoidal output waveform with low Total Harmonic Distortion (THD). Simulation and analysis are carried out using appropriate software tools to validate the performance of the proposed SVPWM inverter. The results demonstrate significant reduction in switching losses and harmonics, leading to improved overall efficiency and reliability of the electric vehicle drive system. This project contributes to the development of high-performance, energy-efficient inverter systems, supporting the advancement of sustainable and eco-friendly transportation technologies.

Keywords: Electric Vehicles (EVs), Space Vector Pulse Width Modulation (SVPWM) Power Electronic Converters, Low Switching Loss Harmonic Elimination, Total Harmonic Distortion (THD)

Paper Id: A608

Context-Aware Image Captioning Using Scene Understanding for Blind Assistance

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Abstract

This paper discusses the significant challenges that visually impaired people are confronting great difficulties in sensing the environment around them. It compromises their safety and independence. This project aims to help blind people by providing them with a voice-based system that uses computer vision for real time feedback about their surroundings. After capturing the live images with a camera, the YOLOv8 object detection model detects multiple objects in these images. It examines the identified items relative to spatial positions to comprehend the broader context of the scene. A mechanism that takes this information and turns it into human-like captions. These descriptions are transformed into audio by using text-to speech technology, enabling visually impaired users to sense their surroundings through sound. This whole system is implemented in Matlab, having a Built in object detection algorithm, Scene Understanding, Generation and Voice response. This project focuses on developing a computer vision-based blind assistance system that provides realtime environmental awareness through voice feedback.

Keywords: Visually Impaired Caption Assistance, Computer Vision, YOLOv8 Object Detection, Scene Understanding, Image Captioning, Assistive Technology, Text-to-Speech, MATLAB, Deep Learning, Artificial Intelligence.

Paper Id. 609

Integrating Behavioural Theory with Modern Technology: A Study of Digital Marketing in Indian E-commerce

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Abstract

In the context of modern trends in engineering, science, management, and technology, digital transformation has significantly influenced consumer behaviour in e-commerce. This paper applies the Decomposed Theory of Planned Behaviour (DTPB) to examine behavioural intentions within India's technology-driven digital marketing environment. The study decomposes the Theory of Planned Behaviour into attitude, subjective norms, and perceived behavioural control, and further analyses sub-constructs such as perceived usefulness, ease of use, trust, normative influence, self-efficacy, and facilitating conditions. With the increasing integration of advanced technologies such as artificial intelligence, data analytics, and digital platforms, the Indian e-commerce sector has experienced rapid growth. Based on a review of existing literature, the paper proposes a conceptual framework linking behavioural theory with emerging technological trends. Findings indicate that trust, technological accessibility, perceived ease of use, and social influence are critical determinants of consumer intention in digital environments. The study contributes to interdisciplinary research by bridging management theories with technological advancements and offers directions for future empirical validation.

Keywords: Decomposed Theory of Planned Behaviour, Digital Marketing, E-commerce, Consumer Behaviour, Technology Adoption, Artificial Intelligence, India

Paper Id: A610

Platform Palettes: How Age Shapes Social Media Use

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ABSTRACT

This study examines the influence of age on social media utilization patterns, focusing on platform preference, usage frequency, and functional purpose. Primary data were collected through a structured questionnaire administered to 183 respondents belonging to different age groups. Descriptive statistics and Chi-square tests were employed to examine the relationship between age and social media usage behavior. The results reveal that younger individuals prefer visually engaging platforms such as TikTok and Snapchat, whereas older users favor communication-oriented platforms like Facebook and Twitter. The study highlights significant age-based differences in social media engagement and emphasizes the need for age-specific communication and marketing strategies.

Keywords: Social media usage, Age-based digital behaviour, Platform preferences, Demographic determinants, Digital engagement patterns.

Paper Id: A611

**MECHANICAL PROPERTIES INVESTIGATIONS OF
ABOLMASCHUS MANIHOT FABRIC
REINFORCEMENT IN POLYMER COMPOSITE**

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ABSTRACT

To develop hybrid composite material by incorporating abolmaschus manihot fibers. To evaluate and compare the mechanical properties of abolmaschus manihot hybrid composites using various test. Methods/ Statistical Analysis: Compression molding machine is used for preparing three hybrid composite laminates, viz, jute/ bamboo/epoxy and jute/kneaf/epoxy. The physical and mechanical properties of abolmaschus manihot composites are found by conducting various test like fabric tensile strength, tensile, flexural, impact etc. Findings: Based on physical and mechanical examination, it is observed that there is no difference in density value and volume fraction of voids. But, there is difference in tensile, flexural, inter laminar shear and impact strengths. The result of this study showed that the abolmaschus manihot fiber reinforced epoxy composite is successfully developed.

Paper Id: A612

Design and Implementation of Compact Single-Stage Dual-Side Interleaved DC-AC Converter with High-frequency Transformer Isolation

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Abstract:

This project presents the design and implementation of a single-stage dual-side interleaved high-frequency isolated DC–AC converter with closed-loop control. The proposed topology integrates both DC–AC power conversion and voltage regulation into a single stage, thereby eliminating the need for multiple conversion stages and significantly reducing overall system losses, component count, and cost. This integration enhances power density and overall efficiency, making the system more compact and reliable. The use of dual-side interleaving on both the primary and secondary sides plays a crucial role in improving performance. It effectively reduces input and output current ripples, leading to lower filtering requirements and improved power quality. Additionally, interleaving helps in minimizing electromagnetic interference (EMI) and distributes thermal stress evenly across switching devices, thereby enhancing system reliability and lifespan. The incorporation of high-frequency isolation using a transformer ensures electrical safety, galvanic isolation, and compatibility with sensitive loads. It also enables high power density due to reduced transformer size at higher operating frequencies. The converter operates efficiently under wide input voltage ranges, making it highly suitable for renewable energy sources such as solar photovoltaic systems and battery storage units. A closed-loop control strategy is implemented to maintain stable output voltage and current under dynamic load and input variations. The controller continuously monitors system parameters and adjusts switching signals accordingly, ensuring fast transient response, low steady-state error, and robust performance. Advanced control techniques can also be integrated to further enhance system stability and efficiency.

Paper Id: A613

Dynamic Roadside EV Charging with Renewable Energy and IoT Monitoring

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Abstract

This project focuses on the design and implementation of an IoT-enabled on-road Wireless charging system for electric vehicles (EVs), powered by renewable energy Sources. The system employs inductive wireless power transfer to charge EVs dynamically While in motion or at designated charging zones, and integrates Maximum PowerPoint Tracking (MPPT) to maximize energy harvested from solar panels Real-time monitoring and control are facilitated through IoT connectivity, allowing Efficient energy management and data-driven operation. The proposed system ensures high charging efficiency, sustainable energy Utilization, and reliable performance, providing a smart and eco-friendly solution for the growing demand for electric mobility.

Keywords: IoT- enabled, On-road wireless charging, Electric vehicles (EVs)Renewable energy, Inductive wireless power transfer, Dynamic charging, Maximum Power Point Tracking, Solar panels. Real-time monitoring, Energy management, Sustainable energy, Eco-friendly mobility.

Paper Id: A614

Jamming Resilient Consensus for Wireless Blockchain Networks

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Abstract:

Wireless blockchain networks represent a significant advancement in decentralized communication by enabling distributed nodes to coordinate and validate transactions without the need for fixed infrastructure. This capability makes them particularly suitable for dynamic and large-scale environments such as Internet of Things (IoT) systems, smart grids, vehicular ad hoc networks, and tactical or military communications. In such scenarios, nodes often operate in highly unpredictable and resource-constrained environments where maintaining consistent connectivity is challenging. While blockchain technology inherently provides security, transparency, and immutability, its effective operation in wireless environments is hindered by the vulnerabilities of the underlying communication medium. One of the most critical challenges faced by wireless blockchain networks is their susceptibility to jamming attacks. Jamming is a deliberate interference technique in which an adversary transmits disruptive signals to block or degrade legitimate wireless communication. Since blockchain consensus mechanisms rely heavily on timely and reliable message exchange between nodes, any disruption in communication can significantly affect the performance and integrity of the system. Traditional consensus protocols, such as Proof of Work (PoW) or Proof of Stake (PoS), are primarily designed for stable and well-connected networks. They do not account for dynamic channel conditions, interference patterns, or adversarial disruptions commonly encountered in wireless environments. In addition to frequency adaptation, the framework introduces interference-aware node selection for consensus participation. Instead of relying solely on static or random selection, nodes are evaluated based on their communication reliability, signal quality, and responsiveness. This ensures that nodes affected by severe interference or potential compromise are less likely to participate in critical consensus operations. Furthermore, redundancy-based message propagation is employed to enhance data delivery reliability. Multiple copies of important messages, such as block proposals and validation signals, are transmitted through diverse paths, increasing the probability that at least one copy reaches its intended destination despite interference. In conclusion, the proposed jamming-resilient consensus framework enhances the practicality and reliability of wireless blockchain networks in hostile and interference-prone environments. By ensuring continuous operation, data integrity, and synchronization among distributed nodes, the framework supports mission-critical applications where secure and uninterrupted communication is essential.

Paper Id: A615

NEURO ADAPTIVE MULTISENSORY LEARNING PLATFORM

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Abstract:

Online video-based learning platforms are widely used for education and skill development; however, they are not equally accessible to users with visual or hearing impairments. Most existing systems are primarily designed for normal users and provide limited support for blind or deaf individuals, making the learning process challenging and less inclusive. To address this issue, this project proposes an AI-assisted adaptive video learning system that delivers personalized and accessible learning experiences for normal users, blind users, and deaf users based on their individual profiles. In the proposed system, users are required to register and log in by providing personal details such as name, age, email, password, and user type (normal, blind, or deaf). Based on the selected user category, the system dynamically adapts the learning interface and interaction methods. For blind users, the platform supports voice-based interaction, allowing users to control video playback using voice commands such as pause and rewind. When a video is paused, the system prompts the user through audio to determine whether a detailed explanation is required. Upon confirmation, a deep description of the paused content is delivered through voice output; otherwise, the video resumes from the paused point. For deaf users, the system provides text-based explanations along with AI-generated sign language animations that visually interpret the video content in real time. When the video is paused or rewound, an in-depth explanation of the content is displayed both as text and sign-language-based visual representation. For normal users, the system offers standard video playback with optional text-based detailed explanations during pause or rewind operations. The system is implemented using Python for backend processing, HTML, CSS, and JavaScript for the frontend interface, and SQLite for database management. By integrating voice recognition, text processing, and AI-generated sign language visualization, the proposed solution ensures inclusive, accessible, and personalized learning for users with different abilities. This project aims to bridge the accessibility gap in digital learning platforms and promote equal learning opportunities for all users.

Paper Id: A616

IoMT Based Smart Doctor Kit for Monitoring of Patient Using Machine Learning.

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Abstract

Recently, medical care systems have been experiencing significant problems because of the absence of sustained surveillance and medical reaction. The old systems rely on checking of files by hands and visiting the hospital which is not applicable to the critical patients or those in isolated communities. They make the patients vulnerable to late diagnosis and decrease the quality of patient care. The proposed paper is a Smart Doctor Kit, which focuses on the Internet of Medical Things (IoMT). The wearable sensors employed in the system to monitor vital health statistics in the form of heart rate, body temperature, ECG, blood oxygen level (SpO₂), and blood pressure.

The data collected is processed in the edge device to provide quick response and subsequently sent to the cloud where it is further analyzed using machine learning methods. It is revealed that the proposed system is more accurate in monitoring and less time-consuming than the conventional systems. It is useful in early identifying of health problems and enabling physicians to make fast decisions. This system is cheap, user friendly and can be used in remote medical and emergency cases. Therefore, the Smart Doctor Kit suggested will offer scalable, reliable, and cost-effective solution to the current healthcare systems, specifically to remote patient monitoring and smart ICU systems.

Keywords: Internet of Medical Things (IoMT), AI-Based Health Monitoring, Remote Patient Monitoring, Wearable Biosensors, Edge Computing in Healthcare, Predictive Analytics.

Paper Id: A617

Sustainable Service Management: The Role of Green Marketing and Digital Innovation in Modern Organizations

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Abstract

The service sector is experiencing rapid transformation due to emerging modern management practices, digital innovation, and growing environmental concerns. This study begins by introducing the concept of modern management and its evolution towards sustainability-oriented strategies in service industries. It explains the importance of green marketing and highlights how environmentally responsible service practices enhance organizational reputation and customer trust. The study further discusses major modern management trends such as digital transformation, artificial intelligence applications, data-driven decision-making, automation, and customer-centric service models. The paper examines the core components of technology-enabled service management, including intelligent systems, digital communication platforms, predictive analytics, and innovation-driven service design. It explores the strategic, operational, and employee-centric benefits that organizations gain through sustainable and technology-supported management practices. Special attention is given to the integration of green marketing in service sectors such as banking, hospitality, healthcare, tourism, and education through eco-friendly operations, paperless systems, and energy-efficient infrastructure. The study also identifies key challenges including ethical concerns, data privacy risks, technological limitations, and human resistance to digital transformation. Furthermore, it outlines emerging future trends such as AI-enabled sustainability monitoring, smart resource management, virtual service platforms, and transparent digital governance. Finally, the paper provides practical recommendations for organizations to adopt ethical frameworks, strengthen data protection, promote employee training, and implement green initiatives through phased strategic planning. The study concludes that integrating modern management innovations with green marketing practices ensures sustainable growth, improved service quality, regulatory compliance, and long-term competitive advantage in the service sector.

Keywords: Sustainable Management, Green Marketing, Service Innovation, Digital Transformation, Eco-friendly Services, Environmental Responsibility, Modern Service Sector, Strategic Sustainability

Paper Id: A618

Integrated Neural Networks: A Holistic Approach to Early-Stage Liver Malignancy Classification

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ABSTRACT

Early detection remains the most critical factor in improving survival rates for patients with liver malignancies, yet conventional diagnostic methods often struggle with the subtle features of early-stage tumors. This research proposes an integrated neural network framework designed to provide a holistic and highly accurate approach to liver cancer classification. Unlike traditional single-architecture models, this study utilizes a multi-stream architecture that concurrently processes disparate data sources, such as high-resolution medical imaging (CT/MRI) and longitudinal biochemical markers. The core of this methodology lies in the synergy between Convolutional Neural Networks (CNNs) for spatial feature extraction and Transformer-based architectures for capturing long-range dependencies within the data. By employing a late-fusion strategy, the system interconnects these advanced algorithms to synthesize a comprehensive diagnostic profile. This holistic integration allows the model to identify micro-vascular patterns and subtle textural irregularities that are often overlooked by isolated analysis. Experimental results demonstrate that this integrated approach significantly outperforms baseline models, achieving a classification accuracy of 98.2% and a marked increase in sensitivity for lesions smaller than 2cm. The findings suggest that the interconnectivity of specialized neural layers effectively compensates for data noise and variability in clinical settings. This research provides a scalable, end-to-end pipeline that supports radiologists in making more informed, evidence-based decisions, ultimately bridging the gap between computational intelligence and clinical oncology.

Keywords: Hepatocellular Carcinoma (HCC), Multi-Stream Neural Networks, Late-Fusion Strategy, Spatial-Temporal Feature Extraction, Computer-Aided Diagnosis (CAD)

Paper Id: A619

CROP YIELD PREDICTION USING MACHINE LEARNING TECHNIQUES

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ABSTRACT

In recent years, the rise of big data has accelerated the adoption of machine learning approaches across diverse domains. Agriculture, in particular, stands to benefit significantly from these advancements, with the potential to enhance crop productivity and quality. This study presents a machine learning-based framework for crop recommendation and yield prediction to support data-driven agricultural decision-making. Exploratory Data Analysis (EDA) is employed to uncover patterns in the dataset, with correlation maps used to visualize feature relationships. The dataset is partitioned into training and testing subsets, and preprocessing includes feature scaling via Standard Scaler and categorical encoding with OneHotEncoder. The proposed architecture integrates Decision Tree Regressor (DTR), Support Vector Regressor (SVR), and Gradient Boosting Regressor as base models, while XGBoost (XGB) and Random Forest (RF) Regressor serve as meta-models within a Stacking Regressor pipeline. Stacking is selected over bagging and boosting due to its ability to combine heterogeneous models in a meta-learning framework. Model performance is evaluated using Mean Absolute Error (MAE), Mean Squared Error (MSE), Root Mean Squared Error (RMSE), and R-squared (R^2) metrics. Results demonstrate that the stacked ensemble provides an effective and practical tool for enhancing agricultural decision-making through advanced machine learning methodologies.

Keywords: Machine Learning, Decision Tree, OneHotEncoder, Ensemble Learning, Random Forest, XGBoost, Agriculture, Yield Prediction

Paper Id: A620

International Financial Reporting Standards and the Transformation of the Indian Banking Sector: Regulatory Challenges, Financial Instrument Revaluation, and Institutional Readiness

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Abstract

The global convergence toward International Financial Reporting Standards (IFRS) has prompted far-reaching transformations across diverse financial sectors, yet the implications for banking institutions in emerging economies remain insufficiently examined. This study provides a comprehensive analysis of the multidimensional impact of IFRS adoption on the Indian banking industry, with particular emphasis on financial instrument classification under IFRS 9, impairment provisioning, hedge accounting, investment valuation, regulatory compliance burden, and human resource readiness. Employing a qualitative documentary research design grounded in institutional theory and financial regulation frameworks, the study critically examines the structural divergences between existing Indian Generally Accepted Accounting Principles (Indian GAAP), Reserve Bank of India (RBI) prudential norms, and the requirements of IFRS as mandated for Indian scheduled commercial banks from April 1, 2011. The analysis reveals that Indian banks confront profound challenges in the domains of fair value measurement, consolidation of financial statements, deferred tax treatment, and information technology infrastructure modernisation. The study further identifies that the transition from incurred loss provisioning models to expected credit loss frameworks constitutes one of the most operationally demanding aspects of IFRS convergence for Indian lenders. The paper concludes by proposing a phased institutional readiness framework to guide Indian banks toward full and compliant IFRS implementation, contributing to the policy discourse on financial reporting reform in emerging market banking systems.

Keywords: IFRS, Indian Banking, IFRS 9, Financial Instruments, Fair Value, RBI Prudential Norms, Financial Reporting Convergence, Emerging Markets, Expected Credit Loss, Hedge

Paper Id: A621

IoT-Enabled Multi-Battery Monitoring with Hybrid Energy-Harvesting Framework for Future Wireless BMS

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Abstract

Electric vehicles (EVs) play a pivotal role in curbing greenhouse gas emissions and advancing sustainable mobility. Central to EV functionality is the Battery Management System (BMS), which safeguards operations, enhances efficiency, and extends battery longevity. Traditional wired BMS designs, however, rely on intricate wiring harnesses that elevate weight, expenses, and upkeep demands while limiting modularity. Wireless Battery Management Systems (WBMS) overcome these challenges by removing physical connections, boosting scalability, dependability, and layout versatility. Yet, prevailing WBMS approaches often use battery-operated sensors, posing ongoing maintenance issues and ecological drawbacks. Energy-self-sufficient wireless sensing offers a greener solution. Battery-less options, especially RFID-based technologies (UHF and NFC), support data exchange via energy harvesting, bypassing the need for integrated sensor batteries. This paper examines cutting-edge WBMS progress, scrutinizes power usage across prevalent wireless protocols, and assesses battery-free RFID sensor viability. It also explores real-world deployments, industry innovations, and prospective pathways for future energy-independent WBMS.

Keywords: Wireless Battery Management System (WBMS), Energy Harvesting, Smart Battery Monitoring, Internet of Things (IoT).

Paper Id: A622

Intelligent Feature Selection Strategies for Cardiac Disease Classification via Machine Learning

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Abstract

Cardiovascular disease (CVD) is still a major cause of death in the world. Time efficiency and accurate diagnosis is very important for the treatment of CVD. With the increasing tendency of using electronic health record (EHR), the use of machine learning for building a screening model for aiding clinicians in high-risk patient stratification is highly recommended. However, most of the ML models rely on all the information provided in the database, which is often not high in quality and composed of high number of irrelevant variables and dimensional feature sets. The effects of three feature selection methods, namely the Chi-Square test, Mutual Information and Recursive Feature Elimination (RFE) on the performance of four widely used classifiers, namely K-Nearest Neighbours, Support Vector Machine, Random Forest and Logistic Regression, are investigated for the classification of cardiac diseases. In this work, the UCI Heart Disease data set is used as the benchmark data set. For all experiments, evaluation metrics used were accuracy, precision, recall and F1-score. It was observed that feature selection technique aided dimensionality reduction gave some improvements to the classifiers. However, improvements differed significantly across the board for all the classifiers used in this study. But the combination of Logistic Regression and RFE gave the highest optimized value for all feature subsets considered. There was an improvement of about 6.52%.

Application Cardiac Disease Classification Using Machine Learning Technique with Dimensionality Reduction Approach

Keywords Cardiac Disease Classification Machine Learning Dimensionality Reduction Chi- Square Mutual Information Recursive Feature Elimination.

Index Terms—Cardiac Disease Classification, Machine Learning, Dimensionality Reduction, Chi-Square, Mutual Information, Recursive Feature Elimination

Paper Id: A623

Crop Doctor: An AI-Powered Multilingual Ecosystem for Real-Time Agricultural Disease Diagnostics and Management

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Abstract

Crop diseases are a problem for food security around the world. They also affect the money that small farmers make in countries like India that are still developing. In areas farmers have a hard time because they cannot get to experts who speak their language. They also need internet. The tools we have now to figure out what is wrong with plants do not work well because of these problems. That is why we made Crop Doctor. It uses computer technology to help farmers find out what is wrong with their plants and how to make them better.

Farmers can use their phones to take pictures of their plants. The system will tell them what is wrong. It can even tell them if there is a risk of the disease spreading. The system talks to farmers in their language, which is really helpful for farmers who cannot read or write. It uses computers that can look at pictures and understand language. It can also make reports that farmers can listen to even when they do not have internet. The system tells farmers how to make their plants better using both methods and chemicals. It also asks farmers for feedback so it can get better at figuring out what is wrong with plants. Crop Doctor shows that technology can help farmers take care of their plants and lose less food. This is good for the planet and, for the farmers.

Keywords: Precision Agriculture, Crop Disease Detection, Artificial Intelligence, Multilingual Systems, Mobile Agriculture Applications, Plant Pathology.

Paper Id: A624

Performance Optimization of Network Intrusion Detection Using Ensemble Learning on NSL-KDD Dataset

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Abstract

Network intrusion detection systems (IDS) are very important for keeping modern communication networks safe from bad things that people do. Naive Bayes and K-Nearest Neighbors are two common machine learning methods that have been used a lot for intrusion detection. However, they don't always work well when the network traffic patterns are complicated, and they often have high false negative rates.

This paper introduces a performance optimization framework for intrusion detection employing ensemble learning techniques on the NSL-KDD dataset. A structured preprocessing pipeline was put in place. It included encoding categorical features, using the Synthetic Minority Over-sampling Technique (SMOTE) to fix class imbalance, and handling data in a way that is aware of the model. We looked at and compared Random Forest and Light Gradient Boosting Machine (LightGBM) to traditional baseline models.

Additionally, decision threshold optimization utilizing precision-recall analysis was implemented to prioritize attack detection and minimize false negatives. The experimental results show that the detection performance has improved a lot, with better recall and F1-score than standard models. The results show that using ensemble learning with threshold optimization is a strong and dependable way to improve modern intrusion detection systems

Keywords - Intrusion Detection System, Ensemble Learning, LightGBM, NSL-KDD, Machine Learning, Threshold Optimization

Paper Id: A625

**A Scalable Neural Interpolation Committee based
Automated Attendance in Dense Classrooms Using
MediaPipe, RetinaFace Synergy, and ArcFace
Embeddings**

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Abstract

Traditional attendance management systems are based on manual systems, which are time consuming and prone to errors and would pose a compliance problem in large requisite classroom or organizational setting. To overcome these shortcomings, this paper will suggest an automated attendance-marking platform that takes advantage of the modern face-recognition algorithms. The suggested system combines the functionality of deep mechanical identification and recognition of faces along with the advanced functionality of detecting and verifying individuals thus providing real-time attendance tracking with high-level security and functionality. The popular deep learning models are applied in face feature extraction to measure performance concerning standard metrics. The experimental evidence shows that the system obtains high recognition rate and will spare much processing time relative to the traditional manual attendance systems. The results suggest that the face recognition-based attendance system proposed enhances reliability, minimizes human errors, decreases the administrative workload, and allows the institutions to locate the attendance records in a timely and effective manner. Keywords - Face Recognition, Automated attendance, Deep Learning, real time, High-Density classroom, occlusion, Variation in illumination, Variation in pose, performance evaluation, Biometric authentication.

Paper Id: A626

Multi-Objective Double Deep Q-Network for Emission-Aware and Fair Traffic Signal Control: A Case Study of a Four-Leg Urban Intersection in Bitola

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Abstract

In cities, urban crossroads often have problems including traffic bottlenecks, high car emissions, and fixed-time signals that don't perform well. Previous studies on the four-way intersection in the middle of Bitola showed that adaptive signal control based on Q-learning worked better than fixed-time solutions. But the first technique only looked at how the environment changed after the simulation and improved overall throughput. This research presents a Multi-Objective Double Deep Q-Network (MOD3QN) framework that concurrently enhances traffic efficiency, diminishes emissions (CO₂, NO_x, PM₁₀), and guarantees equity among techniques inside a cohesive reinforcement learning paradigm. The TraCI interface is used to build up the system in the SUMO microscopic simulation environment so that it may gather real-time data on cars. The suggested deep reinforcement learning model uses gradient clipping, experience replay, target network stabilization, and state normalization to make sure that it converges in both heavy and light traffic. This is different from tabular Q-learning. Throughput increases, queue distribution becomes more even, and average delay and pollutant emissions decrease a lot as compared to fixed-time and tabular Q-learning baselines. The findings say that multi-objective deep reinforcement learning is an effective as well as scalable method for managing traffic signals in smart cities.

Paper Id: A627

An Empirical Comparative Study of Lexical, Semantic, and Hybrid Machine Learning Approaches for Intelligent Resume Screening and Job Matching

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Abstract

Talent acquisition divisions across sectors are confronted with an ever-growing volume of job applications that surpasses the evaluation bandwidth of human recruiters. Processing thousands of resumes per vacancy through manual review introduces delays, inconsistency, and the risk of systematic bias. This work develops a multi-paradigm automated screening framework grounded in Natural Language Processing (NLP) and Machine Learning (ML) to address these operational deficiencies. Three feature-engineering strategies are constructed and evaluated: (i) Term Frequency-Inverse Document Frequency (TF-IDF) lexical encoding paired with Logistic Regression, Support Vector Machine (SVM), and Random Forest classifiers; (ii) Sentence-BERT (SBERT) transformer-based semantic embeddings using the all-MiniLM-L6-v2 checkpoint; and (iii) a Hybrid representation concatenating TF-IDF and SBERT vectors. Experiments are performed on a corpus of 9,544 labelled resume-job pairs derived from 217,473 resume records matched against 606 diverse industry job descriptions exhibiting pronounced class imbalance (20:1 ratio). Results show that SVM achieves the best F1-Score (0.468) on the minority match class, while Logistic Regression attains the highest recall (0.714). All TF-IDF model ROC-AUC scores exceed 0.914. The Hybrid model yields the best minority-class recall of 0.800, making it the recommended configuration for deployment contexts where candidate yield is the primary optimization objective. The system additionally incorporates a resume parsing module, a multi-criteria scoring engine implementing three-tier candidate classification, and a real-time recruiter-facing web dashboard.

Keywords—Resume Screening; Job Matching; TF-IDF; Sentence-BERT; Hybrid Transformer; NLP; Machine Learning; Class Imbalance; Candidate Ranking; Recruitment Automation; Random Forest; SVM; Cosine Similarity; Feature Engineering; Intelligent Hiring.

Paper Id: A628

Design and Performance Evaluation of an Intelligent Hybrid Edge–Cloud Desktop Voice Assistant

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Abstract

The voice assistant in desktop is changing the way people interact with the computer since they allow computer systems to perceive voice commands in a natural way. Initial studies were concerned with speech recognition and natural language processing-based assistants that automate low complexity tasks, including web searches or application openings. However, the majority of available systems are fully dependent on cloud-based services or offline implementation. Cloud-based assistants are good at complex queries but are associated with latency and privacy issues, whereas offline assistants are fast and safe with data, but do not have the capability to compute. In this paper, a hybrid edge-cloud desktop voice assistant is introduced which is a combination of both techniques. Simple processes such as speech recognition and local command execution are done at the edge, whereas complex queries are forwarded to the cloud. An elastic routing system provides effective allocation of tasks. This hybrid design design has been evaluated experimentally and has been found to optimize responsiveness and functionality to provide a balanced answer to intelligent desktop voice interaction.

Keywords : Hybrid Execution Architecture, Adaptive Task Routing, Edge–Cloud Model, Desktop Voice, Speech Recognition, Performance Evaluation, Response Time, CPU usage

Paper Id: A629

Smart Court-AI: A Comprehensive Multi Stage Framework for Judicial Efficiency via Large Language Models, Agentic AI, and Blockchain Enforcement

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ABSTRACT

There is a paradigm shift that is being experienced by the international judiciary now, which is manual. Manual techniques to be automated under the Smart Court. This paper proposes the end-to-end judicial efficiency system incorporating Large Language Models (LLMs). and AI agential to deal with delays. We examine a multistage strategy which employs. Knowledge-integrated prediction into knowledge prediction: LegalReasoner and agential process: LegalMind. optimization that has already shown a reduction in the operational costs by 42.6%. The judicial efficiency model incorporates a hybrid Natural Language Processing (NLP) to summarize long-form documents and to self-supervise learning in order to do it better similar-case retrieval. Moreover, we compare the explainable AI (XAI) and SHAP ways of assuring judicial transparency and integrity. By use of these, anyone can access them innovations, at the preparation of documents automatically as well as the enforcement of judicial determinations of smart contracts, the contribution of the research mentioned in this paper provides a scaffold that can be exponentially extended to a technology based legal system that will guarantee equal and quick access to justice.

Keywords Judicial Efficiency, legal Tech, automated legal drafting, court Backlog Reduction

Paper Id: A630

An Interpretable Hybrid Framework for Customer Churn Prediction Using SMOTEENN and Cost-Sensitive XG Boost

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Abstract:

Customer churn is a major concern for the telecommunication sector, where the cost of acquiring new customers is much advanced compared to retaining being bones . Although different machine literacy models have been introduced to overcome this problem, they still encounter two major obstacles the problem of class imbalance and the lack of interpretability, which makes it delicate for the business community to understand the beginning reasons for the client's churn. This paper introduces an innovative mongrel frame to overcome these limitations and achieve bettered performance and interpretability. The proposed frame uses the SMOTEENN (Synthetic nonage Over-sampling fashion combined with Edited Nearest Neighbours) algorithm to address the problem of class imbalance by barring noisy boundary samples. To classify the data, a Cost-Sensitive XG Boost model is used to give advanced significance to the identification of churners, therefore avoiding the expensive consequences of false negatives. Experimental results demonstrate high predictive efficiency, achieving an Accuracy of 74.9% and an AUC-ROC score of 0.836. Eventually, the proposed frame uses SHAP(Shapley Additive explanations) to offer resolvable AI explanations, which enable the business community to understand the global motorists of churn and the individual threat factors of customers.

Keywords: Leveraging SMOTEENN, Cost-Sensitive XG Boost, and SHAP-based Explainability

Paper Id: A631

Instant mechanic online booking system

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Abstract:

The demand for roadside vehicle repair services requires clear and computerized billing mechanisms as more people use on-demand digital service platforms. Existing mechanic booking apps usually have a set price or manual cost estimation, which leads to unfair pricing and reduced customer confidence. This study proposes an online booking system for instant mechanics based on GPS with a dual-component dynamical model of billing based on travelling distance and service time. The pick-up charge is determined by using the actual time geographical distance between the mechanic and customer by implementing location-based routing algorithms, and the service charge is determined by estimating the actual repair time using an in-built time-tracking mechanism. The architecture discussed in the paper includes a user interface, mechanic interface, centralized server, GPS module, dynamic pricing engine, and secure payment integration to ensure that the operations proceed with ease. The automated billing engine integrates the final price by adjusting the distance and time aspects and improves transparency, fairness, and efficiency. The proposed system will reduce billing scandals, enhance the accuracy of the services, and provide a structure that can be extended to revise roadside assistance platforms.

Keywords— Dynamic pricing, GPS tracking, on-demand services, service duration billing, vehicle repair platform.

Paper Id: A632

GRAS 4.0: A Neuro-Symbolic Framework for Automated Scientific Discovery

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Abstract

The rapid growth of stochastic text generation using Large Language Models (LLMs) has shifted towards logic constrained models of scientific discoveries, which are automated. Nevertheless, the existing architectures share three catastrophic bottlenecks namely computational inefficiency owing to redundant experimentation, which is called Stochastic Amnesia, and lethal errors in adopting multimodal scientific literature, which is called Parsing Noise, and the Reality Gap between generated code and physical implementation. GRAS 4.0 introduces a multimodal vision language integrated architecture is a Neuro Symbolic architecture which is scalable, safe and persistent. GRAS 4.0 releases a vision first lazy-graph topology that achieves a 93% reduction in computational resources compared to text based parsers, via an ingestion of high fidelity visual form. It also applies episodic learning of from failed experiments via a Global Lab Notebook (Vector Memory) and Hierarchical Verification Pipeline which are based on Web Assembly (WASM) sandboxes of Cloud Lab API proxies. GRAS 4.0, which is an error reduction factor, compares to Scientist Bench Hard data which does not subject an experimenter to 60 percent of needless experimentation and 99 percent of safety risks and the start of robotic instructions in a laboratory, respectively. The model enables a transition from simple generators to autonomous scientific agents as independent agents of the scientific process embarking on the self correction process happens.

Paper Id: A633

Design and Development of a Web-Based Student Management System Using Flask Framework

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Abstract:

In this paper, a detailed description of a web-based Student Management System (SMS) developed on the flask framework and its implementation is provided. The system fits in critical issues of educational administration with a role based architecture that supports three major stakeholders who include administrators, teaching personnel and students. Through a unified system to handle attendance tracking, assessment management, course administration, and communication processes, the system helps create great savings in the administrative overhead, as well as enhancing data accuracy and availability. A custom user authentication system is used in the architecture to uphold security and role-specific access control based on a Model-View-Template (MVT) design. Empirical testing shows that there is a 40 percent lessening in administrative processing time and a 35 percent enhancement in data consistency of paper-based systems. The study is a contribution to the increasing literature on educational technology since it introduces a modular framework that is scalable and can be used in various educational settings. The conclusions are that well formulated web-based management systems can significantly improve the operational efficiency of an educational institution and simultaneously provide insights that are beneficial in the decision making process of an institution.

Keywords—Student Management System, flask Framework, Educational Technology, Role-Based Access Control, Web Application Development, Database Design, Educational Administration, Learning Management, User Experience, Data Security

Paper Id: A634

Benchmarking Explainability in Unsupervised Intrusion Detection: A Perturbation-Based Fidelity Analysis of Intrinsic and Extrinsic Methods for CPS Security

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Abstract

The growing trend of using Cyber-Physical Systems (CPS) has increased the need for real-time anomaly detection. This paper presents an overall framework for comparing the fidelity of two different explanation techniques for intrusion detection using Self-Organizing Maps. These techniques are intrinsic attribution using standard deviation for each neuron, while the other is extrinsic attribution using the SHAP Kernel Explainer. This framework is tested using two different datasets, namely NSL-KDD (125,973 training samples, 53 features) and CIC-IDS2017 (100,000 balanced samples, 18 features). A GPU-accelerated version is developed, which can train the model within one second using an NVIDIA RTX 4060 GPU. A novel perturbation-based validation protocol is introduced to measure fidelity by calculating the percentage of cluster reassignments due to perturbations. The results show that SHAP outperforms standard deviation by achieving fidelity at 29.3% (NSL-KDD) and $86.7\% \pm 5.6\%$ (CIC-IDS2017) compared to 4.5% and $61.9\% \pm 13.4\%$, respectively. Statistical results show that fidelity is increased by 14 times ($t = 18.15$) with lower variance using SHAP-based explanations, while stability is improved with five different random seeds.

Paper Id: A635

**ESTIMATION OF THERMAL CONDUCTIVITY OF
NANO FLUIDS USING DEEP NEURAL NETWORK**

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Abstract

This study examines a data-driven approach and system for forecasting and improving the Thermal Conductivity of Nano-Fluids intended for thermal control applications with a focus on defence. Heavy-duty equipment like think tanks, radars, and spacecraft that get hot quickly don't work well with regular coolants. Air movement is very important when demand is higher than the fluid's capacity. A study used a deep learning setup with four entry points to see how well small substances improve the transmission of heat. This system looked at eighteen different blends, each of which mixed different liquids and particles in a different way. Some examples of base carriers are water, ethylene glycol, and oil. The particles that was examined were pure copper, copper oxide, aluminium oxide, and pure aluminium. Combinations covered every match between those materials. One mixture, for example, had water and aluminium oxide in it. Another thing connected ethylene glycol to copper particles. We used different situations to test each pair. There were three types of transformer oil- Every blend tried to be as accurate as possible as it moved through the network. The results, called Exp-Tc/km, were based on how much heat was moved. Learning patterns helped find results without the need for physical testing. Mixtures like copper and water showed certain behaviours. Some, like aluminium in oil, did things differently than other things. Every change was important for practical reasons. Response prediction saves time when compared to just doing lab experiments. The model was trained using more than 250 data points from datasets that can be found on Kaggle. We take into account the temperature, volume fraction, 4 distinct types of nanoparticles, 3 types of base fluid, and the desired Thermal Conductivity. The constructed optimal Artificial Neural Network model demonstrates a high degree of concordance in forecasting experimental data, exhibiting a mean absolute percent error of 0.01% and an overall correlation coefficient of 0.9986 for both training and testing datasets, specifically for Deep Neural Network, Thermal Conductivity and nanofluids.

Keywords—Nano fluids (N.F), Deep Neural Networks (DNN), Thermal Conductivity (T.C), Base fluid (B.F), Artificial Neural Network (ANN), Corbon Nano Tubes (CNT).

Paper Id: A636

Confidence-Based Selective Automation for Risk-Sensitive Credit Default Prediction

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Abstract

Prediction of loan default is a significant issue in financial risk management of banking institutions. The conventional machine learning applications do not necessarily give the confidence of predictions made in all input cases, thus making them unreliable in making decisions in the financial environments that involve risks. In an effort to overcome this shortcoming, this paper will propose a selective automation system of credit risk forecasting that is founded on confidence. In this method, scores of confidence are attained by the model's forecasted probabilities. Those predictions with high confidence are automatically accepted, whereas those with low confidence are delayed to have them checked by a human being to prevent errors. The suggested framework will be tested on the Default of Credit Card Clients dataset, and the machine learning models will be logistic regression, random forest, and XGBoost. The experimental findings indicate the existence of a trade-off between the accuracy of prediction and making decisions based on various confidence levels. Also, cross-validation and calibration analysis on the basis of the Brier score are conducted to determine the reliability of the predicted probabilities. The findings represent that the effectiveness of selective automation in financial systems, which are risk-sensitive, is possible, as long as it is applied in a way that promotes the reliability of such decisions

Paper Id: A637

I. Robustness-Aware Deep Learning Framework for Classification under Noisy Data Conditions

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Abstract-

Deep learning models have done very well at classifying images, but they don't work as well when trained on datasets with wrong labels. In real life, label noise is common because of mistakes made when annotating data and automated data collection methods. This paper examines a robustness-aware training strategy for convolutional neural networks in controlled noisy label environments. A straightforward loss-weighting mechanism is implemented to mitigate the impact of high-loss samples during training, which are more prone to being associated with mislabeled data. We do tests on the CIFAR-10 dataset with label noise levels of 10%, 20%, and 30% added on purpose. We compare the suggested method to a baseline CNN that was trained with standard cross-entropy loss. The results show that the robustness-aware approach always keeps a higher classification accuracy, even when the noise level goes up. For example, at 30% label noise, it improves by up to 1.3%. The results indicate that straightforward adaptive loss strategies can successfully alleviate performance deterioration induced by noisy labels without augmenting model complexity.

Paper Id: A638

Credit Card Fraud Detection Using Machine Learning Algorithms

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Abstract:

With the rapid growth of digital payments, credit card and UPI transactions have become increasingly vulnerable to fraudulent activities, posing significant financial risks. Detecting fraudulent transactions is challenging due to the highly imbalanced nature of transaction data, where legitimate transactions vastly outnumber fraudulent ones. This paper proposes a machine learning-based fraud detection framework that integrates data preprocessing, feature engineering, class imbalance handling, and ensemble learning techniques. The preprocessing stage includes missing value handling, log transformation, normalization, and time-based feature extraction to capture transaction behavior patterns. To address the class imbalance problem, the Synthetic Minority Oversampling Technique (SMOTE) is applied to generate a balanced dataset. The study evaluates multiple classification models, including Logistic Regression, Random Forest, and XGBoost, implemented using Scikit-learn and Imbalanced-learn libraries. Model performance is assessed using metrics suitable for imbalanced datasets, such as Precision, Recall, F1-score, and Precision-Recall Area Under Curve (PR-AUC), rather than relying on accuracy. Experimental results demonstrate that ensemble models, particularly XGBoost, outperform linear models in detecting fraudulent transactions, achieving higher recall and PR-AUC scores. The proposed framework effectively improves fraud detection performance by capturing complex transaction patterns and mitigating class imbalance issues. This work highlights the importance of combining feature engineering and ensemble learning for robust and scalable fraud detection in real-world financial systems.

Paper Id: A639

District-Level Climate-Smart Agricultural Advisory System

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Abstract

Climate change has significant implications for farming practices in Andhra Pradesh, where projected yield losses of various crops in Anglian Pradesh due rising temperatures, unpredictable monsoon cycles, and increasing sea-levels, are estimated between 3.5% and 22%. Furthermore, Andhra Pradesh spans many different and diverse areas ranging from coastal distribution, uplands and interior semi-arid zones; displaying significant integrated vulnerability to climate altered localized impacts, crop and forage pest and disease outbreaks, and economic collapses. Most publications and reports already in existence rely on increasingly aggregated national and state-level data sets, and consequently most of these publications and reports overlook the variations at the district-level. In order to gap this district-level neglect and/or data gap, the proposed study derives a district-level analytical framework to be used in conjunction with OpenWeather API for most current and/or ‘real-time’ meteorological datastore. A crop yield predictor and climate risk and sensitivity analysis is performed utilizing a Random Forest Regressor. In addition, the study employs a chatbot-based ‘real-time’ translation interface to improve access, usability across variegated linguistic groups, and to integrate the latest advancements in Natural Language Processing and generative Artificial Intelligence (AI). Aligned with biofuel research and development from microalgae, the proposed framework integrates environmentally sustainable climate practices and adaptive agricultural strategies and climate change resiliency. A decision support system (DSS), that in addition to district specific recommendations for crop cultivation, optimal crop sowing windows, crop yield covariate predictions, climate risk assessments, and a multilingual AI interactive chatbot ddetermined empirical climate risk, Adaptive farming strategies to improve yields, and expanded DSS services, is provided to the users. The integrated system fosters technological utilization, and the purpose of use, achieving and balancing efficiency, flexibility, and improved inclusivity of the Adaptive Agricultural system with Sustainable Agriculture.

Paper Id: A640

Feature-Based Phishing URL Detection Using Ensemble and Classical Machine Learning Methods

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Abstract: This study addresses the growing threat of phishing attacks, which exploit deceptive URLs to steal sensitive user information. A feature-based phishing URL detection framework is proposed using classical and ensemble machine learning techniques. The system is evaluated on a benchmark dataset of 11,055 URLs characterized by 31 structural, security, and behavioral features. Logistic Regression and Random Forest classifiers are implemented and compared using performance metrics such as accuracy, five-fold cross-validation, ROC-AUC, confusion matrix, precision, recall, and F1-score. Experimental results indicate that the Random Forest model outperforms Logistic Regression, achieving a testing accuracy of 96.92% and an AUC of 0.995. Feature importance analysis highlights HTTPS usage, AnchorURL behavior, and website traffic indicators as key predictive factors. The findings demonstrate that ensemble-based tree models offer strong generalization capability, reduce false negatives, and provide reliable performance. The proposed framework presents an efficient and scalable solution suitable for real-time phishing detection applications.

Keywords: Phishing Detection, URL Classification, Machine Learning, Random Forest, Logistic Regression, Ensemble Methods, Feature Engineering, ROC-AUC, Cybersecurity

Paper Id: A641

Intelligent Traffic Signal Optimization Using Deep Learning and Expert Systems for Emergency Vehicle Priority

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Abstract

The rapid growth of vehicle numbers has created a major problem for cities because traffic congestion now affects all urban regions. The traditional traffic signal control system operates with fixed time cycles, which do not adjust to actual traffic density, so it creates avoidable waiting times that produce both fuel waste and air contamination. The traditional system fails to manage emergency situations properly. This causes ambulance and priority vehicle delays. The existing approaches include two main strategies, which combine sensor-based monitoring with reinforcement learning-based adaptive control systems to improve traffic flow operations. The majority of these methods need expensive hardware installations, yet they focus only on reducing traffic congestion without giving proper attention to emergency vehicle path clearance. The restricted implementation of actual-time video intelligence systems produces incorrect traffic density measurement results. The proposed project aims to establish an Intelligent traffic system optimization, which will utilize CCTV video analytics to solve these problems. The system uses deep learning to identify vehicles while tracking their numbers, so it can modify traffic signals based on how many vehicles travel through each lane. The system contains an emergency vehicle detection mechanism, which takes control of normal signals to create a fast lane for emergency vehicles. The proposed system functions as a software simulation model, which serves smart cities as its primary application.

Paper Id: A642

A Novel Europium(III) Metal Complex Based on 1,4,7-Tris-Aniline Amide Cyclen: Synthesis, Biological Analysis, and Selective Zinc Sensing

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Abstract

In this work, a novel Europium(III) complex with a cyclen framework functionalized with 1,4,7-tris-aniline amide and integrated with a benzimidazole moiety is designed, synthesized, and photophysically characterized. Using mass spectrometry and multi-modal spectroscopic spectroscopy, the synthetic complex's structural integrity was thoroughly verified. The resultant Eu(III) complex showed a clear bathochromic shift and increased molar absorptivity, indicating strong metal-ligand coordination and efficient electronic interaction, whereas the free ligand showed typical $\pi \rightarrow \pi^*$ transitions in the 280–320 nm range. The molecular structures of the ligand (m/z 808.4 [M+H]⁺) and the Eu(III) complex (m/z 1118.2) were verified by ESI-MS analysis; the latter showed a clear isotopic distribution. By use of a metal-ion-modulated antenna effect, the compound serves as a selective luminous probe for Zn²⁺. Zn²⁺ binding to the benzimidazole and aniline amide pendants modifies the Eu(III) core's energy sensitivity, allowing for ratiometric detection. Additionally, time-gated measurements that avoid biological autofluorescence are made possible by the millisecond-range luminescence lifetimes of the Europium center, making this complex a reliable instrument for high-sensitivity diagnostic and environmental monitoring.

Keywords: Europium(III) metal complex, 1,4,7-tris-aniline amide, benzimidazole derivative, (Zn²⁺) ions, autofluorescence.

Paper Id: A643

ECO-FRIENDLY SYNTHESIS OF NICKEL OXIDE NANOPARTICLES USING PRUNUS DOMESTICA FRUIT EXTRACT: A SUSTAINABLE APPROACH FOR GREEN NANOTECHNOLOGY

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Abstract

The development of environmentally benign methods for nanoparticle synthesis is a growing area of interest in green nanotechnology. In this study, nickel oxide (NiO) nanoparticles were synthesized using the fruit extract of *Prunus domestica* (commonly known as plum) as a natural reducing and capping agent. The phytochemicals present in the fruit extract, including flavonoids, phenolics, and organic acids, facilitate the reduction of nickel ions and stabilize the nanoparticles, eliminating the need for toxic chemicals. The synthesized NiO nanoparticles were characterized using UV-Vis spectroscopy, Fourier Transform Infrared Spectroscopy (FTIR), X-ray Diffraction (XRD), and Scanning Electron Microscopy (SEM) to analyze their optical, structural, and morphological properties.. It also emphasized that synthesized NiO NPs are pure, crystalline and single phased. SEM exhibited spherical morphology with particles size of around 30.9 nm aligned with Debye–Scherrer’s calculated average *crystallite size* of 18 nm Results revealed the formation of stable, crystalline NiO nanoparticles with uniform morphology. This green synthesis method not only supports the principles of sustainable chemistry but also provides a cost-effective and scalable route for producing metal oxide nanoparticles with potential applications in catalysis, environmental remediation, and biomedicine

Keywords: Green synthesis, Nickel oxide nanoparticles, *Solanum nigrum*, Phytochemicals

Paper Id: A644

Fluorescence-Guided [Gd(DO3A-Am)] Complex as a Next-Generation Targeted Anti-Cancer Agent

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Abstract:

Fluorescent Magnetic Resonance Angiography (F-MRA) represents an emerging multimodal imaging strategy with the potential to significantly enhance the early detection and characterization of invasive blood cancers. By integrating fluorescence sensitivity with the high spatial resolution of Magnetic Resonance Angiography (MRA), this approach enables the detection of ultra-low leukemic burden and improves diagnostic accuracy in early-stage disease and complex cases such as brain malignancies. Conventional MRA employs gadolinium-based contrast agents (GBCAs) to enhance T₁-weighted signals; however, concerns such as gadolinium retention, nephrogenic systemic fibrosis (NSF), and hypersensitivity reactions necessitate the development of safer, target-specific alternatives. In this context, we propose lipophilic pyrene-functionalized Gd(III) complexes as enzyme-responsive, dual-modal contrast agents targeting intracellular oncogenic markers such as BCR-ABL. These systems exhibit enhanced longitudinal relaxivity ($r_1 = 11.8 \text{ mM}^{-1} \text{ s}^{-1}$ at 1.5 T), exceeding conventional GBCAs ($\sim 3\text{--}5 \text{ mM}^{-1} \text{ s}^{-1}$), thereby improving MRI sensitivity. Concurrently, the pyrene moiety enables strong fluorescence emission with quantum yields ($\Phi_f \approx 0.45\text{--}0.70$) and excitation/emission maxima in the 340–380 nm / 380–500 nm range, suitable for cellular imaging. Key performance indicators include relaxivity, fluorescence intensity, cellular uptake efficiency, and molecular specificity. This multifunctional platform offers significant promise for early diagnosis, real-time monitoring, and precision-guided therapy in leukemia.

Keywords: Fluorescent Magnetic Resonance Angiography (F-MRA), Gadolinium-based Contrast Agents, Pyrene Fluorescent Probes, BCR-ABL Targeting, Leukemia Molecular Imaging.

Paper Id: A645

Adenosine–Gd(III) Theranostic Molecule as Dual Imaging and Immune-Responsive Agent for Targeted Ovarian Cancer Therapy

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Abstract

Ovarian cancer remains a highly lethal gynecological malignancy, with limited progress in early detection and long-term therapeutic outcomes despite advances in antibody-based and targeted treatments. A major challenge lies in identifying reliable molecular markers that are consistently overexpressed in tumors. CA125 (MUC16), a mucin-like glycoprotein, is significantly elevated in epithelial ovarian cancers (EOCs) and contributes to tumor progression through multiple mechanisms. It promotes immune evasion by suppressing natural killer (NK) cell-mediated cytotoxicity via downregulation of activating receptors such as CD16, thereby favoring inhibitory signaling pathways. Additionally, CA125 facilitates metastasis through glycan-mediated interactions, particularly by binding to mesothelin on mesothelial cells, with further stabilization by adhesion molecules such as CD44 within the peritoneal cavity. Its active shedding into circulation and peritoneal fluid correlates strongly with tumor burden, recurrence, and poor prognosis, establishing CA125 as both a diagnostic biomarker and therapeutic target. In this study, we propose the design of lipophilic adenosine amide-fused DO3A-based Gd(III) complexes, [Gd(DO3-(BCAA)-AAM)]·2H₂O, as functionalized MRI contrast agents. These agents are engineered to selectively interact with CA125-expressing cells, enabling enhanced molecular imaging. Expected properties include improved relaxivity ($r_1 = 1.73 \text{ mM}^{-1} \text{ s}^{-1}$) and high target specificity, offering promising applications in precise diagnosis and therapeutic monitoring of ovarian cancer.

Keywords. Ovarian Cancer Imaging, CA125 (MUC16) Targeting, Gadolinium-based MRI Contrast Agents, DO3A Macrocyclic Complexes, Molecular Diagnostic Imaging.

Paper Id: A646

Gadolinium-Based Supramolecular Theranostic Complex for PET/MRI Imaging and Targeted Therapy in KRAS/EGFR-Mutant Lung Cancer

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Abstract

The development of multifunctional molecular complexes has significantly advanced biomedical research, particularly in the integration of diagnostic and therapeutic (theranostic) applications. In this study, we propose a gadolinium(III)-centered coordination complex stabilized by a polyaminopolycarboxylate ligand framework, designed to function as a multimodal imaging and therapeutic agent. Gadolinium-based complexes are well-established magnetic resonance imaging (MRI) contrast agents due to their strong paramagnetic properties, enhancing proton relaxation and improving image resolution. However, conventional agents suffer from limited target specificity and potential toxicity. To address these limitations, the present complex incorporates aromatic acridone amide and thymidine moieties, along with hydrophilic substituents, to enhance stability, solubility, and biomolecular recognition. The complex is specifically tailored for lung cancer applications, particularly targeting tumors driven by KRAS and EGFR mutations, which are critical in tumor progression. It is expected to exhibit enhanced relaxivity ($r_1 = 11.8 \text{ mM}^{-1} \text{ s}^{-1}$) and improved tumor selectivity. Radiolabeling further enables dual PET/MRI imaging, combining high sensitivity with superior anatomical resolution. Additionally, the acridone unit functions as a photosensitizer for photodynamic therapy, while functional groups enable targeted drug delivery. The proposed complex, $[\text{Gd}(\text{DO3}-(\text{Acd-Am})-\text{TyAm})] \cdot 2\text{H}_2\text{O}$, thus represents a promising platform for precision imaging, therapy, and broader biomedical applications.

Keywords: Multimodal PET/MRI Imaging, Gadolinium(III) Theranostic Complex, KRAS/EGFR Targeting, Acridone-based Photosensitizers, Lung Cancer Molecular Imaging

Paper Id: A647

Design and Evaluation of a Tetra-Inosine-Acetate Appended Cyclen–Gd(III) Complex as a Neuroprotective Theranostic MRI Agent

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Abstract.

Macrocyclic ligands, particularly cyclen (1,4,7,10-tetraazacyclododecane), have attracted significant attention in biomedical chemistry due to their exceptional metal-binding ability, structural tunability, and high kinetic stability. Gadolinium(III) complexes derived from cyclen frameworks are widely utilized as magnetic resonance imaging (MRI) contrast agents, owing to their enhanced longitudinal relaxivity, thermodynamic stability, and minimized risk of free Gd(III) release. In this study, we propose the design and synthesis of a novel tetra-inosine acetate appended cyclen ligand, integrating the strong chelating capacity of cyclen with the biological functionality of inosine, a purine nucleoside known for its neuroprotective, anti-inflammatory, and immunomodulatory properties. Upon coordination with Gd(III), the resulting complex, [Gd(DOT-Inosine acetate)·H₂O], is expected to function as a theranostic agent, enabling simultaneous MRI-based diagnosis and neuroprotective intervention. The conjugation of multiple inosine units is anticipated to enhance aqueous solubility, biocompatibility, and selective accumulation in nucleotide-receptor-rich neural tissues. The complex exhibit improved relaxivity ($r_1 = 15.3 \text{ mM}^{-1} \text{ s}^{-1}$ at 1.5 T), facilitating high-contrast imaging of neurological regions. Spectral characterization will confirm structure and coordination behavior: FT-IR (KBr) is expected to show $\nu(\text{C=O})$ at $\sim 1720 \text{ cm}^{-1}$ and $\nu(\text{C-N})$ at $\sim 1250 \text{ cm}^{-1}$; ¹H NMR (D₂O) signals in the δ 3.0–4.5 ppm range for cyclen protons and δ 6.0–8.5 ppm for inosine aromatic protons; UV–Vis absorption maxima near 260 nm ($\pi \rightarrow \pi^*$ transition of purine ring); and ESI-MS confirming molecular ion peaks. This multifunctional system represents a promising platform for advanced neurodiagnostic and therapeutic applications.

Keywords: Cyclen-based Gadolinium Complex, Inosine-functionalized Macrocycles, MRI Theranostic Agents, Neuroprotective Molecular Imaging, Macrocyclic Ligand Design.

Paper Id: A648

Green synthesis of Silver Nanoparticle by using *Mentha spicata* Leaf extract and Evaluation of their Larvicidal Activity

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Abstract

Green synthesis of silver nanoparticles (AgNPs) has emerged as an environmentally friendly and cost-effective alternative to conventional chemical and physical methods. In the present study, silver nanoparticles were synthesized using leaf extract of *Mentha spicata* as a natural reducing and stabilizing agent and their larvicidal activity was evaluated. The phytochemicals present in the leaf extract, such as flavonoids, phenolics and terpenoids, play a crucial role in the reduction of silver ions to nanoparticles and also contribute to their stabilization. The synthesis of AgNPs was confirmed by a visible color change from pale yellow to dark brown, indicating the formation of nanoparticles due to surface plasmon resonance. The synthesized nanoparticles were characterized using various analytical techniques including UV–Visible spectroscopy to confirm the formation of AgNPs, Fourier Transform Infrared (FT-IR) spectroscopy to identify the functional groups involved in the reduction and capping process, X-ray Diffraction (XRD) analysis to determine the crystalline nature and phase purity of the nanoparticles and Scanning Electron Microscopy (SEM) to examine their morphology and size distribution. The results revealed that the synthesized AgNPs were predominantly spherical with nanoscale dimensions and exhibited good stability. Furthermore, the larvicidal activity of the synthesized nanoparticles was tested against mosquito larvae to evaluate their potential application in vector control. The bioassay results demonstrated significant larvicidal efficiency of the AgNPs compared to the leaf extract alone, indicating enhanced biological activity due to the nanoscale properties of silver. The nanoparticles caused high mortality rates in larvae, suggesting their potential as an eco-friendly alternative for controlling mosquito populations responsible for the transmission of vector-borne diseases. Overall, the study highlights the effectiveness of plant-mediated synthesis of silver nanoparticles using *Mentha spicata* and emphasizes their promising application in environmentally sustainable mosquito larval control strategies.

Keywords: *Mentha spicata*, AgNO₃, Uv-Visible, FT-IR, SEM, XRD, Larvicidal activity.

Paper Id: A649

Biosynthesis and Characterisation of Metal Nano Composite Using *PlumeriaPudica*

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Abstract

The present study focuses on the green synthesis and characterization of zirconium–cerium (Zr–Ce) metal nanocomposites using *Plumeriapudica* leaf extract. Plant-mediated synthesis offers an eco-friendly, cost-effective, and sustainable alternative to conventional chemical methods. The phytochemicals present in *Plumeriapudica*, such as flavonoids, phenolics, and terpenoids, act as natural reducing and stabilizing agents in the formation of nanocomposites. In this work, aqueous leaf extract of *Plumeriapudica* was used to synthesize Zr–Ce nanocomposites under controlled conditions. The formation of nanoparticles was initially confirmed by UV–Visible spectroscopy, which exhibited characteristic absorption peaks indicating surface plasmon resonance. Fourier Transform Infrared (FTIR) analysis revealed the involvement of various functional groups responsible for the reduction and capping of nanoparticles. X-ray diffraction (XRD) studies confirmed the crystalline nature and phase purity of the synthesized nanocomposite, indicating successful incorporation of zirconium and cerium metals. The antibacterial activity of the synthesized Zr–Ce nanocomposite was evaluated against selected pathogenic bacterial strains using standard methods. The results demonstrated significant antibacterial efficacy, which can be attributed to the synergistic effect of zirconium and cerium along with bioactive compounds from the plant extract. Overall, this study highlights the potential of *Plumeriapudica* in the green synthesis of metal nanocomposites and emphasizes their promising applications in biomedical and antimicrobial fields. The synthesized Zr–Ce nanocomposite shows enhanced stability, biocompatibility, and antibacterial properties, making it a suitable candidate for future nanotechnology-based applications.

Keywords: *Plumeriapudica*, Zr-Ce metal nanocomposite, Uv-Visible, FT-IR, XRD, Anti-bacterial activity.

Paper Id: A650

Bioactive Pigments from Water-Borne Bacteria: Emerging Applications in Disease Treatment

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Abstract

Waterborne bacteria are distributed in larger aquatic environment, such as rivers, lakes, and drinking water systems. Numerous of these microbes generate natural pigments that have vital biological roles, such as cellular communication, antibacterial activity, and defence against environmental stress. Several bacterial species produce pigments such as prodigiosin, pyocyanin, violacein, and carotenoids, which have garnered a lot of interest because of their potential uses in medicine. Numerous medicinal qualities, such as antibacterial, antifungal, antiviral, antioxidant, and anticancer effects, are displayed by these bacterial pigments. For example, prodigiosin from *Serratia marcescens* exhibits immunosuppressive and anticancer activities, while violacein from *Photobacterium* species exhibits potent antibacterial and anticancer effects. These substances may be useful substitutes for traditional antibiotics since they can stop the growth of harmful germs. However, these natural substances may aid in the creation of novel medications and therapeutic agents; research on pigment-producing water-borne bacteria is becoming more and more crucial. Novel treatments for cancer and infectious diseases may result from an understanding of their biochemical characteristics and modes of action. Thus, a potential field in environmental and medical microbiology is investigating aquatic bacteria as a source of bioactive pigments.

Keywords: Water-borne bacteria; Bacterial pigments; Prodigiosin; Violacein; Antimicrobial activity; Disease treatment.

Paper Id: A651

FREQUENCY CONTROL AND STABILITY ENHANCEMENT OF A GRID-CONNECTED HYBRID RENEWABLE ENERGY SYSTEM USING GWO- OPTIMIZED PI CONTROLLERS

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Abstract

Micro-grid system consisting of a Photovoltaic (PV) and Wind Energy Conversion System (WECS) and Micro hydel system with Permanent Magnet Synchronous Generator (PMSG) is being designed and controlled. The excess energy generated by the PV panel is used to charge the batteries when the energy generated by the PV panel exceeds the energy required by the load. When the electricity generated by the PV panels is insufficient to meet the load's demands, the extra power is extracted from the charged batteries. In addition, the controller protects the battery banks in all conditions, including normal, overcharging, and over discharging conditions. The increasing penetration of renewable energy sources requires advanced control strategies to maintain grid stability and reliable power delivery. Therefore this project proposes a frequency control and stability enhancement strategy for a grid-connected hybrid renewable energy system integrating photovoltaic (PV), wind energy conversion systems based on a doubly fed induction generator (DFIG) and micro hydel system with a permanent magnet synchronous generator (PMSG), along with a battery energy storage system (BESS). The PV system is interfaced through a high-gain NX boost converter to regulate the DC-link voltage, while wind energy sources are connected through appropriate rectification stages. A bidirectional DC–DC converter is used to integrate the battery storage system to support power balancing during fluctuations in renewable generation. The grid interface is achieved using a three-phase voltage source inverter (VSI) followed by an LC filter to ensure power quality. To improve system performance, Grey Wolf Optimization (GWO)-based proportional–integral (PI) controllers are employed for DC-link voltage regulation and wind system control. Additionally, conventional PI controllers are implemented for active power, reactive power, and frequency regulation using the dq0 control strategy. The proposed control framework enhances frequency stability, ensures effective power sharing among renewable sources, and improves dynamic response under varying load and generation conditions. Simulation analysis demonstrates that the proposed system effectively maintains DC-link voltage stability and grid frequency while ensuring reliable and efficient integration of hybrid renewable energy resources

Keywords: Battery Energy Storage systems (BESS), DFIG, High Gain NX Converter, PMSG, Grey Wolf Optimization, VSI, DQ Theory

Paper Id: A652

An Intelligent Mobile Robot for Fire Detection

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Abstract

Fire hazards in residential, industrial and confined environments demand rapid detection and immediate suppression to prevent catastrophic damage. This paper presents the design and development of an autonomous fire-fighting robot capable of detecting and extinguishing small- scale fires using an innovative suppression mechanism based on chloride-based extinguishing balls. The system integrates flame sensors with a microcontroller-driven control unit to enable real-time fire detection and intelligent navigation. The robot is equipped with a mobile platform that allows autonomous movement and obstacle avoidance in dynamic environments. Upon detecting a flame source, the system navigates toward the fire location and deploys chloride-based fire suppression balls. These balls release fire- extinguishing agents that interrupt the combustion process primarily by displacing oxygen and inhibiting the chemical chain reactions necessary for sustaining fire. This approach ensures rapid and localized fire suppression without requiring continuous water supply or high-pressure gas systems. The proposed system is compact, cost-effective and suitable for operation in hazardous or human- inaccessible environments. Experimental results demonstrate reliable flame detection, accurate positioning and effective suppression of small fires. The integration of autonomous navigation with solid-agent fire suppression offers a safer alternative to conventional methods and highlights the potential for smart robotic systems in fire safety applications.

Paper Id: A653

Consumer Buying Behaviour with Respect to Amazon: An Empirical Study with Special Reference to Nagpur City

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Abstract

E-commerce has transformed consumer shopping behaviour worldwide, with Amazon emerging as a dominant player in India's online retail sector. This study investigates the determinants of consumer buying behaviour on Amazon, focusing on the role of online reviews, user interface, demographics, and income levels. Primary data was collected through a structured questionnaire administered to 100 respondents in Nagpur city. Findings reveal that young adults (18–25 years), predominantly postgraduate students, form the largest consumer segment, with online reviews exerting a significant influence on purchase decisions. The study contributes to the literature on e-commerce consumer behaviour and offers actionable insights for businesses to enhance customer engagement and optimize strategies on digital platforms.

Keywords

Consumer behaviour, Amazon, Online shopping, Online reviews, Demographics, India

Paper Id: A654

DESIGN AND DEVELOPMENT OF A FUEL CELL FED DC POWER CONVERSION SYSTEM FOR LOCAL LOAD APPLICATIONS

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Abstract

Fuel cells are emerging as a reliable alternative energy source for distributed power generation due to their high efficiency and low environmental impact. However, the low output voltage characteristics of fuel cells require high-gain DC–DC conversion to meet practical load requirements. This paper presents the design and performance evaluation of a fuel cell fed high-gain DC–DC converter intended for local load applications. The proposed topology achieves enhanced voltage gain using a dual-switch configuration and operates under both open-loop and closed-loop conditions. A proportional–integral (PI) controller is implemented to regulate the output voltage against load and input disturbances. Mathematical analysis establishes the voltage gain relationship of the converter. Simulation studies are carried out under varying load resistance and input voltage conditions to evaluate dynamic and steady-state performance. Results demonstrate significant reduction in overshoot from 32.664% in open-loop operation to 0.723% under closed-loop control. Steady-state error is reduced from 7.94 to 0.6, confirming improved regulation capability. The converter achieves a voltage gain of 4 at 60% duty cycle, validating the theoretical analysis. The proposed system demonstrates suitability for fuel cell based distributed power applications requiring stable high-voltage DC output.

Keywords— Fuel cell; DC–DC converter; High-gain boost converter; PI controller; Voltage regulation; Power electronics; Closed-loop control; Distributed generation.

Paper Id: A655

Art And Architecture of Thiruparuthikundram Temple

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Abstract

The Thiruparuthikundram Temple, pillaiyarpalayam near Kanchipuram, state of Tamil Nādu. Here, there are two temples. The Trilokyanatha temple and the Chandra Prabha temple. Back side of the Trilokynath temple East face Chandra Prabha temple 8th Thirthankara, built in 8th century A.D. It is located in the corner of the garden attached to it. There is a wall around it. which contains a small Mandapam and a shrine. And larger one Trilokyanatha temple belongs to Lord Mahavira 24 Thirthankara, built by pallava king Simha varma -III. Influence of Vijayanagara region styles. Irugappa, a well-known general of King Bukka-II, added the sangeetha mandapa to this temple. Beautiful ceiling paintings depicted on the ceiling. These paintings depict scene of lord Vardhamana, celestial beings. Colours are striking and vibrant, the narratives add a spiritual depth to the space. The temple is today known as Tirukkodabasti. In A.D.1387. A.K. Seshadri (2015).

Keywords: Thrikutabasti, Samavasarana, Illusion, Airavata, Poorna-bimba/prabha

Paper Id: A656

YOLOV8-Based Intelligent CCTV Crime Detection, Prediction and Alert Dashboard System

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ABSTRACT

Ensuring public safety in crowded and sensitive environments requires intelligent surveillance systems capable of identifying threats quickly and accurately. This work presents a real-time crime detection and alert system that utilizes advanced computer vision techniques to analyze live CCTV footage and identify suspicious objects and abnormal human activities. The system employs the YOLOv8 deep learning model to detect crime-related elements such as weapons, unusual behavior patterns, and unauthorized actions within monitored areas. By processing continuous video streams, the system performs automated visual analysis and extracts meaningful spatial and temporal features that help evaluate potential security risks. To enhance proactive security management, the framework incorporates behavior analysis mechanisms that estimate threat levels and identify patterns that may indicate possible criminal incidents. When a suspicious event is detected, the system immediately generates alerts and sends notifications to relevant authorities through multiple communication channels, enabling faster intervention and response. A centralized monitoring dashboard provides real-time visualization of camera feeds, detection results, alert records, and analytical insights, allowing security personnel to track incidents and make informed decisions efficiently. The architecture is designed to support multiple surveillance cameras and can be easily deployed across large-scale environments such as smart cities, transportation terminals, campuses, and residential complexes. By automating monitoring tasks and delivering actionable intelligence, the proposed solution improves situational awareness, reduces dependency on manual observation, and strengthens the effectiveness of modern surveillance infrastructures.

Keywords: Crime Detection, Intelligent Surveillance, YOLOv8, Computer Vision, Real-Time Monitoring, Smart Security Systems.

Paper Id: A657

AI-ENHANCED SMART HEALTHCARE SYSTEM UTILIZING 5G NETWORKS FOR REAL-TIME MONITORING AND PREDICTIVE ANALYTICS

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Abstract

This project suggests a holistic method of transforming agricultural techniques in the rural area through the use of advanced technologies such as Block-chain for the traceability of the products, AI for crop predictions and IoT for monitoring purposes. The core purpose of the integration of Patta number system is to provide as a special identification number of lands owned by farmers and assist them in accessing tailored government schemes and support programs enabling the farmers to manage resources effectively and increase productivity. The project also uses AI technology in predicting the amount of vegetables required in villages at different times, hence effective planning of farm activities to avoid over farming or under farming. With the introduction of AI driven community farming networks, farmers can work together and pool their resources increasing productivity. In addition, AI also enables agroforestry planning that integrates trees and crops in a sustainable manner to improve crop biodiversity and soil health, while genome editing crops to predict their growth is also supporting sustainable agricultural practices.

Paper Id: A658

REAL-TIME ID CARD DETECTION AND DRESS CODE NOTIFICATION SYSTEM USING IMAGE PROCESSING

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ABSTRACT:

The Real-Time ID Card Detection and Dress Code Notification System is a smart monitoring solution designed to improve security and ensure compliance with organizational policies. This system utilizes the YOLO v8 (You Only Look Once version 8) deep learning algorithm to perform fast and accurate object detection through live camera feeds. The primary objective of the system is to automatically identify and verify ID cards worn by employees or students in real time. Using computer vision techniques, the camera continuously scans the environment and detects whether an individual is wearing a valid ID card. If the ID card is missing or not properly visible, the system immediately identifies the violation and can generate a notification or alert to the concerned authority. This helps organizations maintain strict access control and ensures that only authorized individuals are present within the premises. In addition to ID card verification, the system also monitors dress code compliance. By analyzing visual features captured by the camera, the system checks whether the person's clothing follows the predefined dress code rules set by the institution or workplace. If any dress code violation is detected, such as inappropriate attire or nonuniform clothing, the system automatically sends a notification or warning message. The integration of the YOLO v8 object detection model enables the system to process video frames quickly and accurately, making it highly suitable for real-time applications. Compared to traditional manual monitoring methods, this automated system reduces the need for constant human supervision and minimizes errors in identification. Furthermore, the system can be implemented in various environments such as educational institutions, corporate offices, laboratories, and restricted work areas where identity verification and dress code discipline are important. By combining artificial intelligence with computer vision technology, the proposed system provides an efficient, scalable, and reliable solution for maintaining security and organizational standards. Overall, this project demonstrates how modern deep learning techniques can be applied to automate routine monitoring tasks, improve operational efficiency, and create a safer and more disciplined environment within organizations.

KEYWORDS: Real-Time Monitoring, ID Card Detection, Dress Code Compliance, YOLOv8 Algorithm, Object Detection, Computer Vision, Identity Verification, Security Automation, Camera-Based Surveillance, Notification System, Deep Learning, and Access Control.

Paper Id: A659

Physico Chemical Characterisation of Metal Nano Composite using *Calotropis Procera*

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Abstract

The present study reports the green synthesis and physico-chemical characterization of a zirconium–cobalt (Zr–Co) metal nanocomposite using *Calotropis procera* leaf extract as an eco-friendly reducing and stabilizing agent. The bioactive compounds present in the plant extract, including flavonoids, alkaloids, and phenolic constituents, play a crucial role in the reduction of metal ions and stabilization of the synthesized nanocomposite. This approach eliminates the need for toxic chemicals, making the process sustainable and cost-effective. The formation of the Zr–Co nanocomposite was initially confirmed by UV–Visible spectroscopy, which exhibited characteristic absorption peaks indicating successful nanoparticle synthesis. Fourier Transform Infrared (FT-IR) analysis revealed the involvement of functional groups such as hydroxyl and carbonyl in the reduction and capping processes. X-ray diffraction (XRD) patterns confirmed the crystalline nature and phase purity of the nanocomposite, with distinct diffraction peaks corresponding to the Zr–Co structure. The antibacterial activity of the synthesized nanocomposite was evaluated against selected pathogenic bacterial strains, demonstrating significant inhibitory effects. The enhanced antibacterial performance is attributed to the synergistic interaction between zirconium and cobalt nanoparticles, along with the presence of phytochemical residues from *Calotropis procera*. In conclusion, the study presents an efficient green synthesis route for Zr–Co metal nanocomposites with well-defined physico-chemical properties and promising antibacterial potential. These findings suggest that the synthesized nanocomposite can be utilized in various biomedical and environmental applications, particularly in antimicrobial treatments and water purification systems.

Keywords: *Calotropis procera*, Zr-Co metal nanocomposite, Uv-Visible, FT-IR, XRD, Anti bacterial activity.

Paper Id: A660

Synthesis and characterization of polyaniline Zn^{2+} and MoO_3^{6+} metal oxide nanocomposite

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Abstract

Conducting polymer nanocomposites have gained considerable attention due to their improved electrical and structural properties. In this project, a nanocomposite based on Polyaniline (PANI) combined with metal oxides such as Zinc Oxide (ZnO) and Molybdenum Trioxide (MoO_3) is synthesized and studied. The main objective is to compare the influence of ZnO^{2+} and MoO_3^{6+} metal ions on the structural and electrical properties of the conducting polymer matrix. The prepared nanocomposites are characterized using UV–Visible Spectroscopy, Fourier Transform Infrared Spectroscopy (FT-IR), and X-Ray Diffraction (XRD) to analyze their optical behavior, functional groups, and crystalline structure. Electrical conductivity studies are carried out using the Four-Point Probe Method to evaluate charge transport properties. The comparative study helps in understanding how the different oxidation states of ZnO^{2+} and MoO_3^{6+} influence the conductivity and structural characteristics of polyaniline. The results indicate improved conductivity and stability, suggesting potential applications in electronic and sensing devices.

Keywords: Polyaniline Nanocomposites; Zinc Oxide; Molybdenum Trioxide; Structural Characterization; Electrical Conductivity; Four-Point Probe Analysis; Conducting Polymer Materials.

Paper Id: A661

Tailoring Electrical and Optical Properties of Polyaniline via Incorporation of ZnO, MoO₃, TiO₂ and V₂O₅ Nanocomposites

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Abstract

Polyaniline (PANI) is an important conducting polymer known for its adjustable electrical behaviour and good environmental stability. In this study, PANI-based nanocomposites containing ZnO, MoO₃, TiO₂, and V₂O₅ were synthesized using a chemical polymerization approach. Bi-, tri-, and tetra-metal oxide combinations were developed to examine how composition affects structural, optical, and electrical characteristics. The prepared materials were analyzed using UV–Visible spectroscopy, Fourier Transform Infrared (FT–IR) spectroscopy, and X-ray diffraction (XRD). The UV–Vis results showed variations in absorption features, suggesting strong interaction between PANI and the incorporated metal oxides. FT–IR analysis verified the formation of the polymer backbone along with metal oxide interactions, while XRD studies indicated changes in crystallinity. Electrical conductivity measurements using Four Probe Method revealed improvement with increasing number of metal oxide components. These findings demonstrate that incorporation of multiple metal oxides effectively modifies the properties of PANI nanocomposites for potential electronic applications.

KeyWords: Polyaniline, Multi-metal oxide nanocomposites, ZnO, MoO₃, TiO₂, V₂O₅, In-situ polymerization, Four-point probe technique, UV–Vis analysis, FT–IR, XRD analysis, Structural characteristics, Optical behaviour.

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Bio Synthesis of Bi-Metal Oxide Nano Particles Coated with Natural Extract Nanoparticles Created with Centella Asiatica (Vallarai) leaf extract

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Abstract

This study focuses on the green synthesis of nickel oxide (NiO) and cobalt oxide (CoO) nanoparticles coated with Centella Asiatica (Vallarai) leaf extract using a co-precipitation method. The plant extract acts as a natural reducing and stabilizing agent, making the process eco-friendly and cost-effective. The formation of nanoparticles was confirmed through UV–Visible spectroscopy, showing characteristic absorption peaks in the range of ~300–400 nm, indicating successful synthesis. The synthesized NiO/CoO nanoparticles exhibited significant photocatalytic activity in the degradation of organic dyes such as malachite green (20 ppm) under sunlight irradiation. The degradation process was observed over a period of approximately 60–120 minutes, showing a substantial decrease in dye concentration. The reaction followed pseudo-first-order kinetics, demonstrating rapid degradation efficiency. Additionally, the nanoparticles showed enhanced stability, reusability, and functional performance due to the phytochemical coating from Centella Asiatica. Overall, this study highlights an environmentally friendly approach for synthesizing bi-metal oxide nanoparticles with promising applications in environmental remediation and wastewater treatment.

Keyword: NiO/CoO Metal oxide nanoparticles, Centella Asiatica (Vallarai), UV–Visible spectroscopy, Photocatalysis, Dye degradation

About the Editors



Mrs. C. Angel Sarojini serves as the Academic Director at the Xavier Institute for Research and Development, where she oversees institutional growth and technical innovation. An M.Sc. in Mathematics (Distinction) and B.Ed. graduate, she possesses over four years of multifaceted teaching experience spanning primary to postgraduate levels. Transitioning from a high-performing background in Computer Science to executive leadership, Mrs. Sarojini combines technical proficiency in programming and database management with current research in **Big Data, AI, and Cloud Computing**. Her unique ability to blend pedagogical expertise with emerging technologies provides a strategic and comprehensive perspective on modern higher education administration.

Dr. T. Lurthu Pushparaj is an accomplished academic and researcher with 13 years of teaching experience and one year of industrial experience. He currently serves as an Assistant Professor of Chemistry at T.D.M.N.S College, having previously held the position of Associate Professor and Head of the Chemistry Department at Einstein College of Engineering. He earned his Ph.D. in Chemistry from the University of Madras in 2011, with his thesis focusing on the synthesis of Gadolinium complexes as contrast-enhancing agents for Magnetic Resonance Imaging. A recognized Ph.D. supervisor under Manonmaniam Sundaranar University, his research portfolio includes an h-index of 8, an i10-index of 7, and 338 citations. Dr. Pushparaj has an extensive publication record, encompassing 17 SCI-indexed and 19 ISI-indexed journal articles, 5 book chapters, and two patents, including a granted Australian patent for a machine learning-based health prediction model. Furthermore, he has successfully completed several funded research projects, most notably a Rs. 19.08 lakh DST-SERB project focused on developing multimodal imaging agents for cancer treatment.



Dr. M. Appadurai holds a Ph.D. in Mechanical Engineering from Anna University, Chennai, complemented by an M.E. in Engineering Design. With **12 years of academic experience**, he currently serves as an Assistant Professor at Dr. Sivanthi Aditanar College of Engineering, following a five-year tenure at Infant Jesus College of Engineering and Technology. A dedicated researcher, Dr. Appadurai has extensively published books, chapters, and articles in prestigious national and international journals. His core research and professional interests include **Solar Energy, Composite Materials, Finite Element Analysis (FEA), and Hybrid Electric Vehicles.**

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