



VELAMMAL

INSTITUTE OF TECHNOLOGY

Chennai - Kolkata Highway, Panchetti, Ponneri - 601 204



6th International Conference on Artificial Intelligence, 6G Communications and Network Technologies

25th & 26th
MARCH 2026

PROCEEDINGS

Organized By

DEPARTMENT OF ELECTRONICS AND COMMUNICATION
ENGINEERING

In Association with



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(Ministry of HRD Initiative)

**6th International Conference
on
Artificial Intelligence, 6G Communications
and Network Technologies**

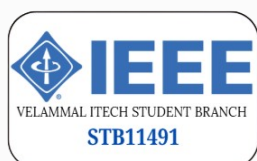
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6G COMMUNICATIONS AND NETWORK TECHNOLOGIES**

“Message From The Chairman ”



Shri. M. V. Muthuramalingam
Chairman, Velammal Educational Trust

It gives me immense pleasure to welcome you all to ICA6NT-2026. This conference represents the zenith of our collective pursuit of knowledge, bringing together scholars, researchers, and industry leaders from across the globe.

As Chairman of Velammal Educational Trust, I am proud to see our institution transcend boundaries and foster innovation in Artificial Intelligence, 6G communications, and network technologies. I wish every participant success in their endeavors and hope this gathering inspires new collaborations and discoveries.

Wish you all the very best!

Director



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“Message From The Director ”



Shri.M.V.M.Sasikumar

Director-Velammal Educational Trust

ICA6NT-2026 is a testament to our vision of academic excellence and global engagement. The Department of Electronics and Communication Engineering is consistently creating a platform that nurtures creativity, innovation, and scholarly exchange.

As Director, I am delighted to see our faculty and students contribute to a conference that not only advances technology but also instills values of integrity and collaboration. May this event be a milestone in your academic and professional journey.

“ A Thousand mile journey starts with a single step. Let this step progresses and reach the destination in time.”

Director-Velammal Educational Trust



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“Message From The Advisor ”



Shri.M. Vaasu
Advisor

I feel elated to welcome everyone to this conference, 'ICA6NT – 2026'. It is with great pride that I extend my warmest greetings to all participants of ICA6NT-2026. This conference transcends conventional boundaries by uniting diverse minds to address challenges and opportunities in AI, 6G, and networks.

I encourage each of you to seize this unprecedented opportunity to share your insights, learn from peers, and contribute to shaping the future of technology. Together, let us elevate this event to new heights of excellence. May this juncture create ripples in the techno world in the future

Advisor



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“Message From The Advisor ”



Shri.K.Razak
Advisor

As Velammalian, I rejoice in the growth of our institution as a banyan tree every year. ICA6NT-2026 is more than a conference; it is a celebration of innovation and collaboration. As Advisor, I am honored to witness the dedication of our organizing team and the enthusiasm of participants worldwide. This gathering provides a unique platform to transcend limitations and explore groundbreaking ideas.

I hope that the spirit of inquiry fostered here will ignite new partnerships and inspire transformative advancements. May this conference be remembered as a turning point in our collective journey toward technological excellence. I also believe all the participants are going to get sumptuous information on Techno world today.

Advisor



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“Message From The Principal ”



Dr.N.Balaji
Principal

“Every day is different and they bring new waves of information and experience.”

It is with great pride that I welcome all participants to ICA6NT-2026, organized by the Department of Electronics and Communication Engineering. This international conference reflects our institution's dedication to fostering academic excellence and global collaboration, with a focus on Artificial Intelligence, 6G communications, and network technologies.

I am confident that the deliberations and research shared here will inspire innovation, broaden perspectives, and strengthen the bonds between academia and industry. I extend my heartfelt congratulations to the organizing committee and wish every participant success in their scholarly pursuits. May ICA6NT-2026 stand as a milestone in our journey towards academic distinction and societal progress.

Principal



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“Message From The Vice Principal ”



Dr.S.Soundararajan
Vice Principal

I am delighted to convey my heartfelt wishes and wholehearted support to the organizers and participants of the International Conference on Artificial Intelligence, 6G Communications, and Network Technologies (ICA6NT-2026), hosted by the Department of Electronics and Communication Engineering.

I trust the research papers and presentations will sow valuable insights, stimulate interdisciplinary collaboration, and accelerate innovation in AI, next-generation communications, and network technologies. Wishing all delegates a successful and enriching conference.

Vice Principal



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“Message From The HOD ”



Dr.B.Sridevi

Dean R&D and HoD/ECE

Today's digital world has changed a lot, with modern inventions and futuristic innovations. This conference, “ICA6NT-2026” is not an exception in this journey. It is an honor for me to welcome all participants to the International Conference on Artificial Intelligence, 6G Communications, and Network Technologies (ICA6NT-2026) organized by the Department of Electronics and Communication Engineering.

This conference provides a platform for researchers, academicians, industry professionals, and students to share knowledge and discuss recent advancements in Artificial Intelligence, 6G communications, Data Computing and emerging network technologies. It aims to encourage academic interaction, research collaboration, and the exchange of innovative ideas in these rapidly evolving fields.

I extend my sincere greetings to all delegates and wish ICA6NT-2026 a productive and successful conference. I strongly believe that all the participants will be enriched and immersed in modern technologies and they remember this conference forever.

HOD/ECE



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“Message From The Coordinator ”



Dr.R.Jothi Chitra
Professor-ECE

It is a privilege for me to serve as a coordinator in ICA6NT-2026. This conference reflects the dedication of our institution to advancing knowledge in Artificial Intelligence, 6G communications, and network technologies. The enthusiasm of participants and the commitment of the organizing team have made this event possible.

Every year, we conduct similar conferences to strengthen and fill the gaps in understanding the difference between academia and industry. This year we have brought, ICA6NT – 2026 with an objective to fulfill all the contemporary techno needs.

I believe ICA6NT-2026 will provide a platform for meaningful discussions, innovative ideas, and collaborative research. I extend my best wishes to all contributors and look forward to the positive impact this conference will create.

Professor-ECE



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“Message From The Coordinator”



Dr. M. Sivarathinabala
Professor-ECE

We, from the department of Electronics and communication engineering try to bring out innovations and prospects every year by conducting conferences for the benefit of our students and staff members. This year is also not an exception.

I am honored and privileged to welcome you all to ICA6NT-2026. The conference embodies our vision of fostering academic excellence and global collaboration. It is inspiring to see scholars, researchers, and professionals come together to share their expertise and explore new frontiers in technology.

This gathering is a celebration of innovation and inquiry. I feel happy to be the part of organizing committee and I appreciate the participants for their dedication. I am confident that ICA6NT-2026 will stand as a milestone in our academic journey. I wish all the very best to the participants and hope this will remain in all your minds forever.

M. Sivarathinabala
Professor-ECE



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“Message From The Chief Coordinator”



Mr. K. Ragupathi
Assistant Professor-ECE

Every day we learn Learning makes us grow. Growth is the evidence of our development To open new avenues and get knowledge in the field of technology, we, Department of Electronics and communication engineering consistently conduct conferences every year.

It gives me immense pleasure to be part of ICA6NT-2026 as a coordinator. This international conference highlights the strength of our institution in creating opportunities for learning, exchange, and advancement in cutting-edge fields. The collective effort of the organizing team and the enthusiasm of participants have brought this vision to life.

I hope the deliberations and research presented here will inspire future collaborations and breakthroughs. My heartfelt wishes go to all participants for a successful and enriching experience at ICA6NT-2026.

Assistant Professor-ECE



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“Message From The Chief Guest ”



Dr. A. Paventhan

**Senior Director (R&D), Scientist-G at ERNET India
IIT Madras Research Park**

I am deeply honored to be the Chief Guest at ICA6NT-2026. This international conference exemplifies the spirit of academic pursuit and technological progress. The themes of Artificial Intelligence and Machine Learning, 6G communications, and network technologies are not only timely but also critical to shaping the future.

I believe conducting similar conferences today is the need of the hour. I commend and appreciate the organizers for conducting such a vibrant conference and encourage participants to engage wholeheartedly. May this event inspire innovation, foster collaboration, and lead us all toward unprecedented achievements that will benefit society at large. I affirm that I am also going to take lots of new concepts and innovations from this conference.

Chief Guest



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“Message From The Chief Guest ”



Shri. S . Raghothaman

**AVP - Space Strategy, Big Bang Boom Solutions
Chennai**

I am delighted to be part of ICA6NT-2026, a conference that reflects the spirit of innovation and academic excellence. The focus on Artificial Intelligence, 6G communications, network technologies, and Signal processing highlights the forward-looking vision of Velammal Institute of Technology and its commitment to addressing the challenges of tomorrow.

This gathering provides a valuable platform for scholars, researchers, and professionals to exchange ideas and inspire new directions in science and engineering. I thank the organizers for their dedication and extend my best wishes to all participants. May ICA6NT-2026 serve as a beacon of knowledge and collaboration, leading us toward greater achievements that benefit both academia and society.

Chief Guest

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Development and Performance Analysis of Helical Antenna for Satellite Communication

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ABSTRACT

Satellite communication systems operating in the S-band require antennas with high gain, wide bandwidth, and circular polarization for reliable signal transmission. This paper presents the design and analysis of an **axial-mode helical antenna operating at 2 GHz** for satellite communication applications. The antenna consists of a conducting helical wire mounted over a ground plane, with **foam used as the supporting dielectric material** to provide mechanical stability and low dielectric loss. The antenna design parameters, including helix diameter, pitch angle, turn spacing, and number of turns, are calculated using standard axial-mode helical antenna theory. The proposed antenna is modeled and simulated using **ANSYS HFSS**, a full-wave electromagnetic solver, to evaluate its performance characteristics. Simulation results demonstrate good impedance matching at 2 GHz with low return loss and acceptable voltage standing wave ratio (VSWR). The radiation pattern shows a strong directive beam along the antenna axis with stable circular polarization. The antenna also achieves adequate gain and an acceptable axial ratio, making it suitable for satellite communication, tracking, and telemetry applications.

Keywords – Helical antenna, axial mode, 2 GHz, ANSYS HFSS, satellite communication.

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INTELLIGENT BABY MONITORING SYSTEM USING DEEP LEARNING AND IOT-ENABLED AUTOMATED CRADLE

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ABSTRACT

The smart baby surveillance project is an application of deep learning, health sensors, and an automatically moving cradle to ensure a responsive and safe environment is established to take care of the infants. A Convolutional Neural Network (CNN) will be used to analyze the cries of babies and classify the sounds produced by the babies into groups, e.g., hunger, pain, or discomfort. The IoT sensors on the intelligent baby monitoring system will also be able to monitor vital signs of the newborns including their temperatures and heart rates, as well as cries. These sensors will identify signs of aberrant physiological conditions. The smart baby monitoring system will provide a GSM alarm to the parents or other caregivers to seek immediate help in case of any form of distress or in case of aberrant eading. The device will be configured to automatically begin rocking the infant in the radle besides sending out alarms; the parents or the other caregivers will not have to do anything manually. The primary goals of this smart baby monitoring device are to enhance the efficiency of childcare, minimize the stress of parents, and provide a more attentive and caring atmosphere to take care of the babies..

Keywords: Baby Cry Classification, Deep Learning,(CNN), IoT Health Monitoring, GSM Alert System.

Paper ID: ICA6NT 110

A CONTEXT-AWARE AND PERFORMANCE-ADAPTIVE AI FRAMEWORK FOR TECHNICAL INTERVIEW PREPARATION

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ABSTRACT

This paper presents VivaTensor, a context-aware and performance-adaptive AI framework for technical interview preparation that addresses the limitations of and singledimensional mock interview systems. The proposed system enables candidates to participate in AI-driven mock interviews, record spoken responses that are converted into text, and receive personalized, reference-based feedback generated through advanced natural language processing and machine learning techniques. Candidate responses are evaluated using a difficulty-performance tensor, which captures multiple performance dimensions including conceptual accuracy, logical reasoning, communication clarity, and confidence. A context-aware adaptive questioning mechanism dynamically adjusts question selection and difficulty based on real-time performance, while company-specific interview pattern modeling simulates organization-aligned assessment practices to enhance realism. The proposed framework introduces a unified adaptive interview architecture that integrates multi-dimensional performance tensor evaluation with context-aware question orchestration and company-specific interview pattern modeling, contributing a scalable, personalized, and industry-aligned approach to AI-driven career preparation. Keywords—AI-driven Assessment, Company-Specific Interview Pattern Modeling, Context-Aware Adaptive Flow, Difficulty Performance Tensor, Firebase Cloud Database, Google Gemini AI, Mock Interview System, Natural Language Processing (NLP).

Paper ID: ICA6NT 112

SMARTSTEP- A PREVENTIVE APPROACH FOR DIABETIC FOOT ULCERATION

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ABSTRACT

Diabetic Foot Ulcers (DFUs) commonly severely complicate diabetes in individuals as poor circulation and peripheral neuropathy mainly cause it. If undetected and unmanaged promptly, these ulcers may cause infection, reduced mobility, plus limb amputation in severe instances. Periodic clinical assessments and self-monitoring customary approaches often miss early warning signs. This project is SMARTSTEP, a smart footwear system designed to monitor key foot health parameters continuously in real-time. The system integrates the humidity, the temperature, and the pressure sensors into that footwear's sole. The ESP32 microcontroller processes input data, initiates therapeutic responses such as activating a vibration motor, and continuously monitors conditions, transmitting data when critical parameter exceeds predefined thresholds. The data that was processed is transmitted wirelessly to a mobile application. This application offers feedback in real-time, alerts, and trend analysis. SMARTSTEP enables early detection for potential ulcer-causing conditions. Also, the system provides therapeutic localized feedback to reduce DFU onset. By an addressing of the key risk factors such as that of excessive plantar pressure, of an elevated foot temperature, and of an amassing moisture, this system proactively and accessibly solves for diabetic foot care. Usability does improve by integration of wireless communication and by a mobile application; also, users and caregivers are alerted on time. Ultimately, SMARTSTEP has the aim of promoting independence as well as increasing the quality of life for those individuals living with diabetes. It offers a personalized so a non-intrusive as well as responsive foot health management system in order to achieve this.

Keywords: Diabetic Foot Ulcers (DFU), smart footwear, plantar pressure, vibration therapy, ESP32, foot monitoring.

Paper ID: ICA6NT 113

A Comprehensive Survey of Deep Learning and Explainable AI Techniques for Multiclass Skin Lesion Classification

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ABSTRACT

Skin lesion classification has emerged as a critical task in dermatological computeraided diagnosis, helping clinicians detect malignancies in their early stages. Recent advancements in deep learning have enabled robust multi-class classification using dermoscopic images. However, challenges remain in data imbalance, limited interpretability, computational complexity, and generalization across heterogeneous datasets. This survey analyzes and compares seven state-of-the-art deep learning approaches—including ensembles of CNNs, IncepX-Ensemble, EFAM-Net, ConvNeXtV2 with focal self-attention, explainable CNN frameworks, federated learning models, and XAI-based ResNet-18 with LIME—to highlight their capabilities, limitations, and clinical implications. A structured review is conducted based on model design, data-set used, evaluation metrics, interpretability scope, and accuracy, with results cross-validated on the HAM10000 data-set. From the analysis, a significant performance improvement trend is observed with hybrid attention-based architectures, interpretability-integrated deep learning, and ensemble learning. To address the identified research gap, a novel system architecture named Fusion-XAI-Attention Network (FXA-Net) can be proposed, combining adaptive attention fusion with explainable feature attribution. A comparative performance graph also given to support future benchmarking.

Keywords-Skin lesion classification, deep learning, explainable AI (XAI), convolutional neural networks, attention fusion, HAM10000 dataset.

Paper ID: ICA6NT 117

DEEP LEARNING BASED LUNG CANCER CLASSIFICATION

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ABSTRACT

Lung cancer is a major cause of cancer-related mortality worldwide, necessitating accurate and early diagnostic methods. Traditional diagnostic techniques, including biopsy and manual medical image analysis, are time-consuming and prone to human error. This paper proposes an automated lung cancer classification approach based on deep learning using the IQ- OTH/NCCD Lung Cancer Dataset. The proposed system employs MobileNetV2, a lightweight and computationally efficient convolutional neural network suitable for deployment on resource-constrained platforms. MobileNetV2 utilizes depth wise separable convolutions, inverted residuals, and linear bottlenecks to reduce computational complexity while maintaining effective feature extraction. Lung CT images are classified into three categories: normal, benign, and malignant, using optimized pre-processing, data augmentation, and hyper parameter tuning to improve model generalization. The performance of the model is evaluated using standard metrics, including accuracy, precision, recall, and F1-score. Experimental results demonstrate high classification performance, achieving an accuracy of 99.92% with superior precision, recall, and F1-score for benign cases. A confusion matrix is used to analyze class-wise classification results. The findings indicate that the proposed MobileNetV2- based model provides reliable and efficient lung cancer detection, showing strong potential for realtime clinical decision support and computer-aided diagnosis systems.

Paper ID: ICA6NT 122

Intelligent Antenna Systems Powered by CMOS SRAMBased In-Memory Computing Macros for AI- Driven Communication

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ABSTRACT

The convergence of artificial intelligence (AI), intelligent antenna systems, and edge computing is revolutionizing next-generation wireless communication. However, the traditional von Neumann architecture, with its inherent memory bottleneck, hinders realtime neural processing. To overcome this, CMOS-compatible SRAM-based In-Memory Computing (IMC) macros offer a promising alternative for embedded intelligence. This review paper explores the design, implementation, and application of SRAM IMC architectures in AI-driven antenna systems ,focusing on beamforming, pattern recognition, and direction-of-arrival (DoA) estimation. The paper discusses macroarchitectures, analog -mixed signal computing strategies, neural network mapping, and CMOS process considerations, providing a comprehensive outlook on how such integration enables low-power, ultra-fast, adaptive antenna systems in emerging communication technologies.

Keywords: CMOS, SRAM, in-memory computing, antenna intelligence, neural network hardware, edge AI, beamforming.

Development of a Soft-Switched Four-Port Converter for Hybrid PV-Battery Systems in Frequency Regulation Applications

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ABSTRACT

Hybrid photovoltaic (PV) energy systems are increasingly used in standalone, microgrid, and weak-grid environments due to their sustainability and deployment flexibility. However, the intermittent nature of solar generation, combined with fluctuating load demands, creates challenges in maintaining power stability and efficiency. Conventional architectures typically rely on multiple DC-DC converters to interface PV modules, battery storage, and auxiliary DC sources independently, resulting in higher switching losses, increased cost, and complex control coordination. This research presents the development of a soft-switched four-port DC-DC converter integrating a PV source, a battery storage system, and an auxiliary DC input into a common powerprocessing stage feeding a regulated DC-link. The proposed system applies a dual-layer control strategy using the dsPIC30F4011 controller. The first layer ensures DC-link voltage regulation through PI-controlled PWM switching, while the second layer employs DQ0 reference frame current control to manage inverter-based real and reactive power delivery. Soft-switching minimizes switching losses and enhances efficiency across varying load and solar conditions. Simulation results obtained through MATLAB/Simulink 2024a demonstrate stable DC-link regulation, reduced ripple at the PV input, and efficient coordination of energy flow between the PV source and battery storage. The system is shown to be suitable for frequency support, load balancing, and improved power continuity in renewable-based microgrid environments.

Keywords:Four-Port Converter; Hybrid PV System; Soft Switching; DQ0 Control; Battery Energy Storage; Voltage Source Inverter

Paper ID:ICA6NT 135

Campus Cart : E-commerce Website with Personalized Recommendations

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ABSTRACT

Campus Cart is an AI-enabled ecommerce solution designed for smarter ecommerce experience using optimized recommendations and smart system management. In conventional ecommerce solutions, search and filter-based systems are primarily used, which may be time-consuming and inefficient. Campus Cart combines AI technology with secure login and real-time inventory management for smarter and more intuitive ecommerce experience. Campus Cart enables users to search products via natural search, get recommendations based on their budget and type, and finish transactions effectively. The system also contains an admin panel for managing products, users, and orders. The proposed system showcases how AI-driven interactions and advanced web technology can improve usability and efficiency of ecommerce solutions.

Experimental results on the platform show enhancement in system response times, effective handling of orders, and improved human interaction compared to the conventional e-commerce system. The findings clearly show that the combination of recommendation using AI and structured management of the backend has a significant impact on the efficiency of the system.

Paper ID: ICA6NT 138

SMART ECO:AI PLANT CARE POT

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ABSTRACT

A smart Digital Plant Pot system is presented that integrates IoT, automation, and artificial intelligence to enable efficient, sustainable, and low-maintenance plant care. This paper focuses on the development of a smart Digital Plant Pot that integrates Internet of Things (IoT), automation, and artificial intelligence to enable efficient and sustainable plant care with minimal human intervention. The system uses soil moisture sensors to monitor water levels and automatically control irrigation, preventing overwatering and underwatering. Temperature and humidity sensors are employed to observe environmental conditions and maintain optimal growth conditions for plants. A mobilebased IoT application allows users to monitor plant health in real time, receive alerts, and remotely control irrigation. The system is powered by solar energy, making it energyefficient and environmentally friendly. Additionally, image processing techniques are used for early detection of plant diseases, enabling timely preventive measures. This approach reduces water wastage, improves plant health, and optimizes energy usage, making it suitable for home gardening, urban farming, and smart agricultural applications.

Keywords: Smart Agriculture, Internet of Things (IoT), Automated Irrigation, Plant Disease Detection

Paper ID:ICA6NT 160

Design and Analysis of Wide Band Rectangular Patch Antenna for Sub-6 GHz 5G Communication

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ABSTRACT

The advancement of 5G wireless communication technologies necessitates the development of compact, high-performance antennas that can operate efficiently within the sub-6 GHz frequency range. This study introduces the design and evaluation of a rectangular patch antenna (RPA) with enhanced bandwidth characteristics using defected ground structure (DGS), specifically tailored for 3.45 GHz applications in 5G systems. The antenna was meticulously designed to occupy a compact size of 18.25 x 13.76 x 1.6mm³. Constructed on an FR-4 Epoxy substrate, which has a relative permittivity of 4.4 and a copper layer thickness of 0.035 mm, the design ensures cost-effective production while maintaining structural integrity. Performance metrics indicate a maximum gain of 3.75 dB, reflection loss (S₁₁) of -17.12 dB, and bandwidth of 860 MHz, all of which satisfy the stringent requirements of contemporary 5G systems. To demonstrate the advantages of the proposed design, a standard RPA was implemented and evaluated under identical conditions.

Keywords—5G communication, rectangular patch antenna, miniaturization, enhanced gain

Paper ID:ICA6NT 170

IoT Based Smart Safety and Worker Alert System for Cracker Factories using ESP32 and AI/ML

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ABSTRACT

Firecracker manufacturing units and other hazardous industries face significant risks from flame ignition, toxic gas leaks, abnormal temperature rises, and electrical faults. Conventional safety methods often rely on manual inspections and reactive alarms, which can delay emergency responses and compromise safety. This paper presents a smart safety monitoring and emergency alert system powered by the ESP32 microcontroller, integrating AI and IoT for real-time hazard detection and automated safety actions. The system continuously monitors temperature, humidity, gas concentration, flame intensity, voltage, and current via multiple sensors. A rule-based decision algorithm classifies workplace conditions into four safety states: SAFE, WARNING, DANGER, and EMERGENCY. Corresponding protective measures such as power shutdown through relays, exhaust ventilation activation, simulated sprinklers, alarms, and cloud notifications are triggered based on this classification. Real-time visualization is provided through the Blynk IoT platform, while ThingSpeak manages data logging and analysis. Sensor data and alerts are efficiently shared using the MQTT protocol, and critical emergency notifications are sent via IFTTT SMS and email alerts. Experimental validation under simulated hazard conditions demonstrates reliable detection and rapid response, confirming this system's effectiveness as a low-cost solution for enhancing safety in high-risk industrial environments.

Paper ID: ICA6NT 173

A Temporal-Behavioral Hybrid Deep Learning Framework for Ultra-Accurate Real-Time Fraud Detection in Large-Scale ECommerce Transaction Ecosystems

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ABSTRACT

E-commerce is growing very fast, which has increased the rate of online fraud that has created a significant financial and security threat to online platforms. High transaction volumes, dynamic user behaviour and change of attack strategies make real time fraud detection a very complex task to handle. The proposed study suggests a hybrid-based deep learning model to be used in detecting online fraud based on the transaction data. The model incorporates the Long Short-Term Memory (LSTM) networks to learn sequences of the transactions, neural networks to learn the representation of the features adaptively, and a Random Forest classifier to improve the strength of the decision. The proposed method achieves the correct binary classification of fraudulent and legitimate transactions by combining temporal, behavioural and statistical features. Experimental analysis exhibits better detection capability than traditional machine learning modality, especially when dealing with unbalanced data and sophisticated fraud designs. The findings suggest that the hybrid architecture presents a scalable and effective tool in detecting real-time frauds on the modern e-commerce systems and therefore leads to improved security of transactions and customer trust.

Keywords : Fraud detection in e commerce, Hybrid deep learning, Transaction data, LSTM, Random Forest, Neural networks, Online security.

Paper ID: ICA6NT 176

REAL-TIME PREDICTION OF OXYGEN UPTAKE DEMAND USING BIOREMEDIATION TECHNIQUES AND VIRTUAL SIMULATION IN RENEWABLE ENERGY APPLICATIONS

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ABSTRACT

The BOD (Biological Oxygen Demand) is an important design parameter in water bodies. It defines the oxygen needed to can billion of organic matter, which is breakdowns by microbes. precise BOD measurement is essential to safeguard the health of aquatic ecosystem. But regular in-lab BOD determining procedures are time-consuming and takes at least 4 days. Virtual laboratories and simulators for BOD estimation are brilliant optimization methods available for BOD estimation (Biological Oxygen Demand) within shortest possible time in a realistic manner. These techniques are cost-effective, timesaving, mobilized with user-friendly features and can be repetitively used as fetching the learning needs with variation, can be acclaimed by students, researchers and environmentalists. the Increasing incorporation of renewable-energy technology in waste water treatment units assures sustainable pollution abatement by reducing the organic matter at the very origin of the water body. Even the innovative bioremediation means, for instance: microalgae- bacteria dual systems, exarceb the treatment process. these studies emphasize the role of virtual laboratories in BOD determination with water quality assessment.

Keywords—Biological Oxygen Demand (BOD), Virtual Laboratory, Wastewater Treatment, Renewable Energy, Bioremediation, Microalgae Bacteria Consortia, Environmental Sustainability.

Paper ID: ICA6NT 180

PREDICTING YOUTUBE VIDEO PERFORMANCE USING XGBOOST

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ABSTRACT

Predicting the performance of YouTube videos prior to publication remains a significant challenge for content creators. This paper proposes an AI-based content performance prediction system leveraging machine learning techniques. The system analyzes historical YouTube video metadata and engagement metrics to forecast potential reach and engagement levels. By discerning patterns that correlate with video success, the proposed methodology enables creators to refine content strategies preemptively. Consequently, it facilitates data-driven decision-making and enhances the consistency of content performance outcomes.

Paper ID: ICA6NT 184

MULTI – MODAL SMART STETHOSCOPE

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ABSTRACT

The Multi-Modal Smart Stethoscope represents a significant advancement in medical diagnostic technology, integrating traditional auscultation with modern digital capabilities. This innovative device combines high-fidelity acoustic sensors, advanced signal processing algorithms, and multi-modal data acquisition to enhance the accuracy and efficiency of cardiovascular and pulmonary assessments. The stethoscope is equipped with integrated electrocardiogram (ECG) and phonocardiogram (PCG) sensors, allowing for simultaneous monitoring of heart sounds and electrical activity. Additionally, it incorporates machine learning algorithms to assist in the detection of abnormal heart and lung sounds, providing real-time diagnostic support to healthcare professionals. The device also features wireless connectivity, enabling seamless data transfer to electronic health records (EHR) and telemedicine platforms, facilitating remote patient monitoring and collaborative care. The Multi-Modal Smart Stethoscope is designed to improve diagnostic accuracy, reduce the burden on healthcare providers, and enhance patient outcomes through early detection and intervention. Its user-friendly interface and portability make it an invaluable tool for both clinical and field settings, revolutionizing the way auscultation is performed in modern medicine.

Paper ID: ICA6NT 185

Power Theft Detection Using IoT

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ABSTRACT

Electricity theft is a worldwide issue. Major economic losses are caused to power utilities and governments by electricity theft, leading to higher electricity tariffs for honest consumers. Serious safety hazards, including electric shocks and fires, are also created by electricity theft, environmental pollution is increased through extra power generation, and legal and administrative burdens are added to electricity departments. Automatic identification of energy tapping using two current transformers, IoT technology to upload energy tapping data to the Thing Speak cloud using a Wi-Fi module, visible alerts through an LCD display, audible alerts using a buzzer, and the use of a PIC microcontroller have been reported as effective objectives for theft detection systems. Energy tapping is detected when the current difference between source-side and load-side CTs exceeds a predefined threshold value. The LCD provides real-time visual status, while the buzzer generates an audible alert immediately upon detection of energy tapping, ensuring quick response and effective monitoring of power theft events.

Keywords: Energy tapping, Current transformer, PIC microcontroller, Internet of Things, Wi-Fi, Thing speak.

Paper ID: ICA6NT 187

Performance and Efficiency Assessment of Microstrip Patch Antennas in 5G Wireless Networks

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ABSTRACT

The advent of 5G technology has spurred significant advancements in antenna design to achieve faster data speeds, greater network capacity, improved throughput, and lower latency. These capabilities are critical for supporting sophisticated applications like 4K/8K video streaming, virtual and augmented reality, remote surgery, and the expanding Internet of Things (IoT). To meet 5G's rigorous requirements, antennas must perform reliably in millimeter-wave (mmWave) frequencies, including 28 GHz and 38 GHz, which suffer from elevated propagation losses. To address these challenges, 5G antennas incorporate high gain to concentrate radiated energy, thereby enhancing signal strength, extending coverage, and ensuring reliable connectivity.

Microstrip patch antennas (MPAs) are extensively used in 5G systems due to their compact, low-profile design, enabling seamless integration into devices like smartphones, tablets, and compact base stations. They offer key advantages such as lightweight construction, low manufacturing costs, and excellent compatibility with 5G's highfrequency bands. Their planar structure makes them ideal for Multiple-Input MultipleOutput (MIMO) configurations, which are essential in 5G for boosting data rates, enhancing capacity, and maintaining reliable signal performance. By enabling effective beamforming and spatial multiplexing, MPAs fulfill 5G's stringent demands, supporting high-density connectivity and the advanced needs of next-generation wireless networks.

Paper ID: ICA6NT 189

An AI-Resistant Dual-Layer Secure Communication Framework Using AES Encryption and Adversarial Noise-Driven Image Steganography

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ABSTRACT

The reliability of traditional image steganography methods like Least Significant Bit (LSB) embedding has been considerably diminished by recent developments in artificial intelligence (AI)-based steganalysis [3], [7], [9]. While strong secrecy guarantees are provided by cryptographic techniques such as the Advanced Encryption Standard (AES), the visual existence of encrypted data may raise suspicions during transmission [2], [12]. Therefore, in AI-monitored communication contexts, depending only on encryption or traditional steganography is inadequate.

To overcome security issues, a dual-layer AI-resistant covert communication architecture is presented that combines adversarial noise-assisted image steganography with AES encryption. To guarantee confidentiality and integrity, the secret message is first encrypted using AES [5], [10]. Spatial-domain steganography is then used to embed the encrypted payload into a digital image, supplemented with carefully constructed adversarial perturbations that lower the detection accuracy of deep learning-based steganalysis algorithms [9], [16]. In contrast to traditional methods, the applied adversarial noise selectively reduces the performance of convolutional neural network (CNN)-based detectors while preserving perceptual image quality

Paper ID: ICA6NT 190

COGNIVault - THE NEXUS OF COGNITION AND CONTROL

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ABSTRACT

The modern environment of institutional management is experiencing a paradigm shift in the process of convergence of AI, IoT, and Distributed Ledger Technology. CogniVault is an ambit of modern hostel monitoring that has been verified through research as a more effective method for institutions situated in cities and towns having an urban- wildlife interface. CogniVault uses edge-native deep learning to automate attendance, protect premises, and alleviate the human-wildlife conflict (HAC). The system uses a multimodal biometric authentication channel, applying ArcFace to ECAPA- TDNN, which are fused using a weighted sum rule for high-fidelity verification. To address data integrity, the model uses a permissioned Hyperledger Fabric blockchain, which creates an audit trail that cannot be altered. Furthermore, a real-time object detector module based on the NVIDIA Jetson platform using YOLOv8 achieves sub-500ms latency to detect wildlife intrusion. This report provides a technical analysis of the system elements, such as the mathematical premises of the loss protocol and consensus protocols. Comparative benchmarks illustrate the efficiency of CogniVault in maintaining operational efficiency, physical security, and integrity of data, with pilot exercises registering no cases of tampering with the ledger.

Paper ID: ICA6NT 192

TrackChain : A Transparent Tracker Logger using Blockchain Audit Trail

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ABSTRACT

The contemporary web ecosystem is increasingly dominated by third-party tracking technologies that enable user profiling, targeted advertising, and behavioral analytics. While these mechanisms offer economic and functional benefits, they simultaneously introduce significant privacy risks due to opaque data collection practices, cross-site tracking, and limited user awareness. Existing privacy tools largely focus on blocking or listing trackers, providing limited analytical insight and no verifiable accountability. This paper presents trackChain, an AI-assisted privacy risk intelligence and forensic audit framework that integrates browser-level tracking detection, behavioral analysis, and blockchain-backed integrity assurance. The proposed system captures third-party web requests through a browser extension, applies explainable intelligence techniques to infer tracking intent, computes a quantitative privacy risk score for visited websites, and anchors cryptographic hashes of normalized tracking events on a blockchain to ensure tamper-evident auditability. The paper focuses on system design, risk modeling, and prototype-level validation, demonstrating the feasibility of intelligence-driven and forensically verifiable web privacy assessment.

Paper ID:ICA6NT 196

NEUROFLEX: A REAL-TIME, WEARABLE NEURO-MUSCULAR REHABILITATION SYSTEM USING SOFT ROBOTICS

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ABSTRACT

Neuromuscular disorders caused by stroke, paralysis, nerve injuries, and muscular degeneration severely impair a patient's ability to perform voluntary movements and essential daily activities. Conventional rehabilitation relies on therapist-guided exercises that are time-consuming, costly, and often inaccessible to patients who live far from rehabilitation centers or cannot attend frequent sessions. This paper presents Neuroflex, an intelligent hand-based neuromuscular rehabilitation system that integrates Electromyography (EMG) sensing, machine learning-driven decision making, and robotic actuation within a closed-loop framework. EMG signals acquired from intrinsic hand muscles are preprocessed using an ESP32 microcontroller and analyzed using a Python-based machine learning model to generate personalized rehabilitation commands. These commands are executed by an Arduino-controlled MG995 servo motor mounted on a custom 3D-printed robotic exoskeleton. Experimental testing demonstrates reliable detection of low amplitude hand EMG signals, adaptive rehabilitation behavior, and safe robotic-assisted motion. The proposed system offers a low-cost, portable, and scalable solution suitable for both clinical and home-based neuromuscular rehabilitation.

Paper ID:ICA6NT 197

Silent Voice: AI-enabled real-time speech-to-sign language conversion with animated avatars for public events

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ABSTRACT

Silent Voice is an AI-enabled system designed to foster true inclusion by providing real-time conversion of spoken language into animated sign language avatars, ensuring accessibility and dignity for persons with hearing and speech impairments during government functions and public events. By integrating advanced speech recognition, natural language processing, and avatar-based sign rendering, the system eliminates dependency on scarce human interpreters while delivering accurate and culturally appropriate communication. Leveraging a curated sign language database and modular architecture, Silent Voice can be deployed across diverse platforms such as live broadcasts, public screens, and mobile applications, making it scalable for large gatherings and official events. Beyond accessibility, the solution empowers individuals to participate fully in civic, educational, and social contexts, aligning with the vision of equitable digital transformation and bridging communication gaps to create a society where every voice – silent or spoken – can be heard and understood

Paper ID: ICA6NT 198

TrustNet Building trust in social networks.

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ABSTRACT

In recent times social networks has become important in our daily life, but it also accelerates the spread of fake information that can mislead the public and cause financial or social harm. This project introduces a hybrid framework for identifying fake news in social media posts by integrating text analysis techniques , intelligent learning algorithms , and text extraction from images .The system analyzes both text posts and image-based content by extracting text with OCR and translating non-English inputs into English for uniform processing. A fine-tuned BERT model, supported by rule-based checks for domain-specific rumors, assigns a credibility score along with reasoning to help users assess authenticity. Experimental evaluation shows that this hybrid approach improves accuracy compared to traditional text-only methods, offering a reliable tool for identifying misinformation in real time.

Paper ID: ICA6NT 209

AI-Powered Crime Risk Zone Identification and Visualization

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ABSTRACT

Criminal activities continue to rise in many regions, creating an urgent need for data-driven tools that can assist in proactive policing and urban safety planning. The Crime Risk Zone Identification and Visualization System is a web-based analytical platform designed to identify and predict areas with a high concentration of crimes using machine learning and spatial analysis. The system employs the DBSCAN (Density-Based Spatial Clustering of Applications with Noise) algorithm to detect dense clusters of criminal incidents based on geographic coordinates. It integrates Flask for backend operations, MySQL for secure data storage, and interactive visualization libraries for presenting real-time hotspot maps. By analyzing spatial and temporal crime data, the system provides actionable insights that support law enforcement agencies, researchers, and policymakers in developing effective crime prevention strategies. This model demonstrates how artificial intelligence and geospatial analytics can enhance public safety through predictive intelligence and data visualization.

Paper ID: ICA6NT 210

AN INTEGRATION OF HEART RATE AND GESTURE BASED SPEECH DEVICE FOR SPEECH IMPAIRED PEOPLE USING MOBILE APPLICATION

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ABSTRACT

Those with speech and hearing difficulties still find themselves in much trouble talking in the contemporary non-slow world especially when interacting with those who use the non-sign language. These difficulties usually lead to social loneliness, discomfort and dependence. To counter this drawback, this project provides a gesture-to-speech translating model in real-time, which is a smart hand glove based on Arduino, and it has an inbuilt health-checking capability. The glove possesses an accelerator sensor that tends to measure the location of hands, direction of hands, and movement with regards to the specific gestures. Effective real-time communication is possible due to the process and translation of these motion signals to relative text and vocal output. The device will have a temperature sensor and a heart rate sensor that will continuously monitor the vital health parameters of the user in addition to assistance in communication. As a means of offering user security during the process of prolonged consumption, the data collected in the physiological form can be relayed or communicated in straightforward health awareness. Health tracking feature is more reliable and user-friendly and the system of real time feedback allows to communicate easily and naturally. This cheap, compact, and lightweight system can not only expand the reach of communication but also contribute to the simple health monitoring, which will provide greater autonomy and self-esteem, as well as the quality of life of individuals with speech/hearing disabilities.

Paper ID: ICA6NT 215

TOOTHCOMM: SMART MORSE-BASED VOICE COMMUNICATION FOR SPEECH-IMPAIRED PEOPLE

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ABSTRACT

Effective communication remains a critical challenge for individuals with speech impairments, often limiting their independence and social interaction. This paper presents a smart assistive communication system that enables speech-impaired users to convey messages using a Morse code-based tooth-controlled input mechanism. The proposed system captures intentional tooth-press signals through a compact pressure sensor interface, where variations in signal duration are interpreted as Morse code dots and dashes. These signals are processed in real time using a microcontroller and decoded into alphanumeric characters based on a predefined Morse code dictionary. The decoded text is subsequently converted into intelligible speech using a text-to-speech module, allowing clear verbal communication with caregivers and surrounding individuals, while an OLED display provides simultaneous visual feedback to enhance reliability and user confidence. The system is designed to be compact, lightweight, energy-efficient, and cost-effective, making it suitable for continuous daily use in assistive and healthcare environments. Unlike conventional assistive communication systems that rely on hand gestures, eye tracking, or complex interfaces, the proposed solution requires minimal physical effort and supports hands-free operation. Experimental evaluation demonstrates accurate Morse signal detection, reliable character decoding, and low response latency, indicating that the proposed system offers an efficient, practical, and user-centric solution for speech-impaired communication and highlights the potential of embedded assistive technologies in promoting inclusive human-computer interaction.

Paper ID: ICA6NT 217

GREENBRIDGE: SMART SOIL FOR TRIBAL CORPORATE HARMONY

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ABSTRACT

Reliable communication and early warning systems are critical for ensuring safety in remote hilly and forest regions where conventional wireless communication infrastructure is unreliable or unavailable. Communities in such areas are frequently exposed to emergencies such as wild animal intrusions, medical crises, and natural disasters, with limited means to transmit alerts in a timely manner. To address this challenge, this paper proposes an AI assisted soil-based emergency communication system that integrates intelligent monitoring with an infrastructure independent alert mechanism. The system employs a computer vision algorithm to monitor the surrounding environment using a camera module and detect animal intrusion in real time. Upon detecting a potential threat, the system automatically triggers an emergency alert. A keypad interface is also provided to allow manual alert initiation during critical situations, ensuring reliable operation. The alert signal is generated by an embedded microcontroller and transmitted through the soil, which serves as the communication medium, reducing dependence on radio wave propagation. The received signal is forwarded to an IoT based monitoring platform, enabling real time notification to authorities. The system also provides local voice alerts in regional languages for immediate awareness. Designed to be low cost, energy efficient, and easy to deploy, the proposed system offers a practical and reliable solution for emergency communication in remote and wildlife prone regions.

Paper ID: ICA6NT 218

AI- based mock interview platform

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ABSTRACT

Interview preparation remains a significant hurdle for job seekers due to a lack of realistic practice environments and objective evaluation metrics. This paper introduces a specialized AI-driven mock interview platform designed to simulate professional interview scenarios via voice-driven human-AI interaction. Utilizing a modular architecture composed of Next.js, Node.js, and Google Firebase, the system facilitates rolespecific question generation and adaptive dialogue management. A voice-enabled conversational AI module, powered by Vapi, emulates interviewer behavior to enable natural, real-time communication. Beyond simulation, the platform integrates an automated evaluation engine that provides personalized feedback and performance insights across technical and behavioral dimensions. Experimental analysis indicates that this scalable solution effectively enhances user engagement and interview readiness.

MACHINE LEARNING ENABLED ROVER FOR NAVIGATING AUTONOMOUS AND ROUGH TERRAIN

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ABSTRACT

This paper presents the design and implementation of a machine learning (ML)-enabled rover capable of autonomous navigation across rough terrains. The system integrates ESP32 and ESP32-CAM microcontrollers with multiple sensors for terrain classification, obstacle detection, and navigation control. A lightweight ML model is deployed for realtime decision-making, enabling the rover to adapt to varying surfaces and environmental challenges. The rover combines vision-based analysis and sensor fusion to achieve robust performance while maintaining low cost and energy efficiency. Experimental results demonstrate reliable navigation, obstacle avoidance, and adaptability in uneven terrain conditions. Potential applications include mining safety, disaster response, and planetary exploration.

DYNAMIC WIRELESS CHARGING OF ELECTRIC VEHICLE USING SOLAR ENERGY

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ABSTRACT

The rapid growth of Electric Vehicles (EVs) has increased the need for safe, efficient, and user-friendly charging technologies, as conventional wired charging systems suffer from issues such as cable wear, safety risks, higher maintenance, and reduced user convenience. Wireless Power Transfer (WPT) technology provides an effective solution by enabling contactless energy transfer, thereby improving safety and reliability. This paper presents the design and analysis of a wireless electric vehicle charging system integrated with an efficient DC-DC converter and a battery management approach. The proposed system employs inductive coupling between transmitter and receiver coils to transfer power wirelessly, where high-frequency AC at the transmitter generates a magnetic field that induces voltage in the receiver coil. The received AC power is converted to DC using a rectifier, and a SEPIC (Single-Ended Primary Inductor Converter) DC-DC converter is used to regulate the charging voltage under varying coupling and load conditions due to its step-up and step-down capability with non-inverted output. A Battery Management System (BMS) is incorporated to monitor battery voltage, current, temperature, and State of Charge (SoC), ensuring safe charging by preventing overcharging, deep discharge, and thermal stress. The complete system is modelled and simulated using MATLAB/Simulink, and the results demonstrate stable output voltage, reduced current ripple, and improved charging efficiency, indicating that the proposed wireless charging system is a safe and efficient solution for future electric vehicle charging infrastructure.

PG-GAT Based Channel Estimation for Enhanced OFDM Performance

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ABSTRACT

In this work, we propose an improved Physics- Guided Graph Attention Network (PG-GAT mini v2) for channel estimation supported by pilots in Orthogonal Frequency Division Multiplexing (OFDM) systems. Conventional Least Squares (LS) interpolation methods exhibit severe degradation in high- mobility environments due to rapid time-varying fading and sparse pilot allocation. To address this limitation, the proposed model integrates graph attention mechanisms with physics- based priors to refine LS estimates via residual learning. A graph structure is constructed where pilot subcarriers are depicted as nodes, and their relationships are represented by weighted edges. The PG-GAT mini v2 further employs residual connections, Layer Normalization, and expanded hidden dimensions to enhance training stability and convergence. Experimental evaluation under a high-mobility Rayleigh fading channel scenario (300 km/h, 2 GHz carrier) demonstrates that the proposed method achieves a significant decrease in Normalized Mean Squared Error (NMSE) relative to the LS baseline (0.308 vs. 0.784). These results underscore the potential of physics-guided graph attention frameworks for robust and reliable channel estimation in next- generation wireless communication systems.

SMART SPINAL POSTURE MONITORING SYSTEM FOR SCOLIOSIS PATIENTS

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ABSTRACT

Scoliosis is a chronic musculoskeletal condition marked by aberrant axial rotation and lateral curvature of the spine. Periodic radiographic imaging and Cobb angle measurement are the main methods used for clinical evaluation and follow-up. These procedures are expensive, subject patients to cumulative ionizing radiation, and are not appropriate for continuous or home-based monitoring. This research suggests a low-cost, non-invasive, Internet of Things-enabled smart spinal posture monitoring system for the real-time identification and analysis of aberrant spine alignment in scoliosis patients in order to overcome these limitations. To get three-dimensional orientation and motion data, the suggested system makes use of several inertial measurement units (IMUs) placed strategically along the lumbar, mid-thoracic, and upper thoracic areas of the spine. Using pre-established clinical thresholds, an ESP8266- based wireless microcontroller processes data on-board, calculates relative angular deviations between spinal segments, and detects aberrant posture. An integrated alarm system promptly notifies the user of any persistent posture deviation and encourages them to take corrective action. Processed posture data is simultaneously sent to a cloud platform so that physicians can store it securely, view it remotely, and analyze it over time. Experimental validation shows that incorrect spinal alignment may be reliably detected under a variety of postural settings and validates the viability of continuous posture monitoring. With the potential to clinical burden and reliance on radiographic evaluation, the suggested system provides a workable biomedical engineering solution for home-scoliosis monitoring.

Paper ID:ICA6NT 235

AI BASED PRE-STROKE PREDICTION AND VARICOSE VEIN DETECTION

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ABSTRACT

Varicose veins and stroke are major worldwide health issues that need to be diagnosed as soon as possible to avoid serious consequences. Timely medical action is limited by the manual, time-consuming, and reactive nature of conventional diagnostic approaches. An AI-based integrated system for varicose vein diagnosis and pre-stroke risk prediction is presented in this research. In order to predict the risk of stroke, clinical and lifestyle factors such age, blood pressure, cholesterol, body mass index, glucose level, and behavioral factors are analyzed using a logistic regression model. A Convolutional Neural Network (CNN) analyzes medical images to detect aberrant vein patterns and categorize the severity of varicose veins. Early diagnosis, data-driven decision-making, and preventative healthcare are supported by the results, which are presented via a web-based interface.

Paper ID: ICA6NT 238

SMART EMG MONITORING SYSTEM FOR MUSCLE FATIGUE DETECTION

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ABSTRACT

Electromyography (EMG) measures muscle response or electrical activity in response to a nerve's stimulation of the muscle. The test is used to help detect neuromuscular abnormalities. The goal of the paper is to use an ESP32 microcontroller to create a real-time Electromyography (EMG) monitoring device. Through an EMG sensor, the system collects bioelectrical signals produced by muscle action and processes them for visualization and alert production. The ESP32 analyzes the processed EMG signals and, as an instant alarm mechanism, sounds a buzzer when it detects abnormal muscle activity or threshold breaches. The system's web-based interface, which is hosted by the ESP32, is a distinctive feature. enabling remote monitoring of sensor values and live EMG signals. The website shows instantaneous measurements, historical data logs for trend analysis, and real-time muscle activity graphs. This method allows for flexible observation of physiological indicators across several platforms, including PCs, tablets, and cell phones, and does away with the requirement for wired connections to external displays. Applications in sports science, physiotherapy monitoring, medical diagnostics, and human-computer interaction research can all benefit from the suggested system. When paired with wireless web-based monitoring, its inexpensive hardware architecture offers a scalable and easily accessible option for real-time EMG data collection and processing of patient, for immediate intervention of doctor. Future improvements could include multisensor fusion for more thorough biological monitoring, machine learning-based pattern detection, and interaction with cloud storage.

COLLEGEGO: Digital College Bus Management System

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ABSTRACT

The Digital College Bus Management System is a smart transportation solution developed to improve safety, monitoring, and efficiency in college bus services. It integrates hardware devices installed in buses, a mobile application, and cloud technology to provide realtime tracking and automated management of transportation activities. Traditional college bus systems rely on manual attendance and limited monitoring, which often cause delays and safety issues. The proposed system replaces these methods with a digital platform for better control and communication. Each bus is equipped with GPS units and safety sensors that continuously track vehicle location and detect abnormal movements. The real-time data is sent to the cloud, allowing students and college authorities to monitor bus positions accurately and receive instant alerts during emergencies. This helps improve punctuality and ensures quick response to critical situations. The mobile application allows students to view bus locations, receive arrival and delay notifications, and mark attendance using a QR-based system. All attendance and tracking data is stored securely in the cloud, reducing paperwork and errors. Administrators can monitor bus operations, manage user information, and analyze transportation performance efficiently. For added safety, a hidden video monitoring feature and an SOS emergency alert function are included in the system. The video monitoring helps maintain discipline and provides evidence during incidents, while the SOS feature enables immediate communication with authorities. Overall, the Digital College Bus Management System provides a secure, efficient, and intelligent solution for modern college transportation management. It improves safety, transparency, and service quality while reducing manual workload.

A SMART CENTRALIZED GRIEVANCE REDRESSAL SYSTEM LEVERAGING SENTIMENT-AWARE ANALYTICS AND MULTILINGUAL INTERACTION

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ABSTRACT

Resolving citizen grievances is an essential part of contemporary government since it has a direct effect on administrative transparency, service quality, and public trust. Language difficulties, a lack of centralized tracking, delayed response times, and an inability to implement intelligent prioritization algorithms are just a few of the drawbacks of traditional grievance management systems. These difficulties lead to poor governance outcomes, decreased public satisfaction, and ineffective complaint handling. With the goal of offering a clever, scalable, and user-friendly platform for filing, monitoring, and addressing grievances, this project suggests A Smart Centralized Grievance Redressal System Leveraging Sentiment-Aware Analytics and Multilingual Interaction for Governance. The suggested solution combines a Django-based backend for data management, role-based administration, and complaint processing with a Reactbased frontend for user interaction. Automated prioritization and complaint resolution status prediction are made possible by the system's use of sentiment-aware analytics to evaluate past complaint data and calculate severity levels. Translation APIs are used to provide a bilingual interface that supports both Tamil and English, ensuring accessibility and inclusivity for a variety of language groups. Additionally, the technology gives managers dashboards to track complaints, examine patterns, and enhance governance decision-making by visualizing data.

The experimental findings show that the suggested system dramatically raises citizen satisfaction, decreases response times, promotes transparency, and handles complaints more efficiently. To enable effective and clever grievance redressal procedures, this system can be expanded to public service organizations, e-government portals, and smart city governance.

PAPER ID: ICA6NT 247

MRI IMAGE BASED LIVER TUMOR IMAGE SEGMENTATION USING DEEP LEARNING TECHNIQUES

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ABSTRACT

Effective diagnosis and treatment planning depend on the early and precise identification of liver abnormalities, such as tumors, from CT and MRI studies. Medical image segmentation and analysis done by hand takes a lot of time, is subjective, and is prone to human mistake. An intelligent and automated Liver and Tumor Analysis AI Dashboard that combines deep learning-based segmentation with an intuitive clinical interface is presented in this research to address these issues. To enable accurate liver boundary recognition, the suggested system uses a U-Net-Swin CNN hybrid architecture that combines Swin Transformer blocks for global contextual learning with Convolutional Neural Networks for local feature extraction. The segmented liver's worrisome areas are further identified by a specialized tumor detection model, which also evaluates the tumor's size, count, and area ratio to determine its severity. Stream lit is used in the system's implementation to offer real-time visualization, quantitative measurements including Dice score, IoU, accuracy, precision, and recall, as well as comprehensive clinical insights and reports that can be downloaded. While retaining computational performance in CPU contexts, the hybrid design increases diagnostic reliability and segmentation robustness. The technology can help radiologists and support computer-aided diagnosis in healthcare settings because experimental assessment shows accurate liver segmentation and dependable tumor detection.

Paper ID: ICA6NT 251

AUREL: AI-Driven Block chain Platform for Authentic Product Verification and Trusted Recommendations

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ABSTRACT

The increasing presence of counterfeit skincare and cosmetic products poses significant threats to consumer safety and market trust, while conventional authentication approaches such as QR codes and centralized verification systems remain susceptible to replication and tampering. To address these challenges, this paper presents AUREL, an AI-driven blockchain platform designed for secure and transparent product authenticity verification. Genuine products are registered on a permissioned blockchain ledger using unique identifiers and cryptographic hash values to ensure data integrity and traceability. The proposed system combines blockchain-backed validation with AI-based visual analysis to enable reliable real-time verification. In addition to identity authentication, AUREL incorporates scan-based behavioral analytics to identify abnormal usage patterns that may indicate counterfeit distribution. When suspicious or fake products are detected, the platform assists users by recommending verified genuine alternatives. By integrating decentralized verification, intelligent visual inspection, and usage-based anomaly awareness, AUREL provides a scalable and consumer-centric framework for combating counterfeit products in personal care markets.

Paper ID:ICA6NT 253

INTELLIGENT HONEYPOT DECEPTION FRAMEWORK WITH BIDIRECTIONAL LSTM AND AUTOMATED PREVENTION FOR ADVANCED PERSISTENT THREATS

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ABSTRACT

The research presents a comprehensive honeypot-based scheme integrating detection, prediction, and automated prevention capabilities for advanced persistent threat mitigation. The system processes network security events from honeypot deployments, applying multi-dimensional analysis through Isolation Forest anomaly detection, DBSCAN clustering, and Bidirectional LSTM neural networks. Beyond traditional passive monitoring, the framework automatically generates six categories of deployable prevention measures: intelligent firewall rules, adaptive rate limiting configurations, incident response playbooks, network segmentation strategies, STIX/TAXII-compliant threat intelligence feeds, and predictive attack forecasts. Experimental validation using 15,742 AWS honeypot attacks demonstrates 97.5% prediction accuracy, 98% attack block rate, and 93% reduction in response time. The Streamlit-based interactive dashboard provides real-time situational awareness through seven specialized interfaces encompassing overview metrics, advanced analytics, LSTM predictions with 95% confidence intervals, 3D geographic visualization, automated intelligence reports, network simulation, and prevention solution generation. This integrated approach transforms honeypots from passive observation tools into active defense platforms, bridging the critical gap between threat intelligence and actionable security responses.

Paper ID: ICA6NT 254

IoT based Solar Powered Fertilizer Sprayer

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ABSTRACT

The growing demand for sustainable farming methods has led to exciting advancements in technology-based solutions. Our project introduces a solar-powered IoT fertilizer sprayer, which serves as an efficient and environmentally friendly alternative to traditional fertilizer application techniques. This system integrates renewable energy, IoT-based local connectivity, and automation to improve the accuracy and effectiveness of fertilizer spraying.

The sprayer primarily relies on solar energy, collected through photovoltaic panels that charge a battery, making its operation both sustainable and economical. The system is built around the ESP32 microcontroller, which provides both processing power and wireless communication capabilities.

A key feature of our system is the use of the Dabble app, which communicates with the ESP32 via Bluetooth Classic. This allows users to wirelessly control the sprayer through a smartphone interface without the need for additional hardware. The intuitive interface of the Dabble app makes it easy to send commands and manage the system in real-time. The setup includes a solar charging circuit, a motorized sprayer, and a Bluetooth-enabled ESP32 microcontroller. With local IoT integration, users can monitor and control the system from short distances, ensuring accurate fertilizer distribution while minimizing waste.

By eliminating manual effort, reducing dependency on non-renewable energy, and enabling smart control, our system addresses key challenges in modern agriculture. The solar-powered IoT fertilizer sprayer demonstrates the potential of combining renewable energy and smart technology to support environmental sustainability and enhance farming productivity.

Paper ID: ICA6NT 256

EDGE-AI BASED CALIBRATION OF CAPACITIVE PRESSURE SENSORS WITH DRIFT FOR EMBEDDED DEPLOYMENT

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ABSTRACT

The increasing demand for accurate and reliable pressure sensing in industrial and wearable applications has driven the adoption of capacitive pressure sensors. However, practical deployment is often limited by inherent non-linearity due to polymer dielectric compression, measurement noise from environmental and electronic sources, long-term drift caused by aging and temperature effects, and sensor-to-sensor variation during manufacturing. Conventional linear calibration methods fail to capture these complex behaviors, while deep machine learning models, though accurate, are computationally expensive and unsuitable for embedded edge devices with limited memory and processing power. This project addresses these limitations by proposing a software-only Edge-AI calibration framework that converts raw capacitance readings into precise pressure values using an offline-trained regression model. The proposed system generates realistic sensor datasets and processes the capacitance signals to learn calibration parameters that compensate both non-linearity and drift. A time-index feature is incorporated to model systematic drift, enabling stable long-term calibration without repeated manual recalibration. The trained model is exported as a lightweight closed-form equation, allowing edge inference through simple arithmetic operations without requiring ML libraries at runtime. The solution is further validated through cross-sensor generalization by training on one sensor dataset and testing on another, demonstrating robustness against device variation. In addition, a data-efficiency evaluation confirms that

accurate calibration can be achieved with limited calibration samples, making the method practical for real-world deployment. By integrating offline machine learning with embedded-friendly equation export, this project establishes an interpretable and efficient calibration strategy that bridges high-accuracy regression modeling with real-time edge execution, enabling dependable pressure sensing in resource-constrained systems.

Paper ID: ICA6NT 257

A Deep Learning Algorithm for Ship Detection in Satellite Images

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ABSTRACT

Ship detection in satellite imagery is essential for maritime surveillance, coastal monitoring, and defense applications. However, reliable detection remains challenging due to small object sizes, complex sea backgrounds, low spatial resolution, and illumination variations. This study investigates deep learning-based ship detection using advanced YOLO-based models, including YOLOv5, YOLOv8, and YOLO-NAS. A comparative evaluation indicates that YOLO-NAS achieves superior detection performance compared with the baseline models. To further improve detection reliability, an Improved YOLO-NAS model is proposed to enhance feature representation and prediction confidence while maintaining localization accuracy. Experimental results demonstrate improved true-positive confidence and overall detection reliability compared to baseline approaches. The proposed method enhances the effectiveness of satellite-based ship-detection systems for real-time maritime monitoring and remote-sensing applications.

Paper ID: ICA6NT 258

Comparative Study of Substrate Materials for an InsetFed Rectangular Microstrip Patch Antenna at 1.9 GHz

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ABSTRACT

This paper focuses on the design and simulation of an inset-fed rectangular microstrip patch antenna using different substrate materials for wireless L-band applications. The proposed antenna is designed to operate at a resonant frequency of 1.9 GHz, which lies within the L-band region. Three different dielectric substrate materials are considered: Arlon AD320, FR4 (epoxy glass), and vacuum (air), having dielectric constants of 3.2, 4.4, and 1.0, respectively. The antenna is designed and analyzed using Ansys HFSS simulation software, and its performance characteristics are compared for different dielectric constants. The simulation results show that a maximum bandwidth of 40 MHz with a gain of 2 dB is obtained using FR4 ($\epsilon_r = 4.4$), where the return loss is -35.67 dB. The maximum gain of 9.72 dB with a bandwidth of 39 MHz is achieved using vacuum (air) ($\epsilon_r = 1.0$). In contrast, a gain of 6 dB and a bandwidth of 25 MHz are obtained using Arlon AD320 ($\epsilon_r = 3.2$), with a return loss of -24.57 dB. The proposed antenna is suitable for applications such as military telemetry, GPS, GSM mobile communications, and amateur radio systems.

Paper ID: ICA6NT 260

Influence of Superstrate on a 2.4 GHz Patch Antenna for Wi-Fi and Bluetooth Applications

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ABSTRACT

Microstrip antennas are extensively employed in modern communication systems such as high-speed vehicles, missile systems, armored vehicles, and satellite communications. Their popularity is attributed to advantages including compact size, low weight, reduced fabrication cost, planar configuration, and ease of integration with microwave integrated circuits. This work focuses on the design and fabrication of a rectangular microstrip patch antenna excited using a coaxial probe feed. The antenna is designed to operate at a frequency of 2.4 GHz using an Arlon Diclac 880 dielectric substrate. Experimental analysis has been carried out to examine the radiation behavior of the proposed antenna. In addition; the influence of various superstrate materials placed above the radiating patch has been experimentally investigated. Superstrates with dielectric constants of $\epsilon_r = 2.2, 3.2, 4.8,$ and 10.2 were considered. The experimental results reveal that the introduction of a superstrate modifies the antenna characteristics and causes a downward shift in the resonant frequency. The resonant frequency is observed to vary depending on the dielectric constant of the superstrate. Moreover, an increase in dielectric constant leads to higher return loss and VSWR, while the antenna bandwidth and gain show a decreasing trend. Based on the experimental observations, the superstrate material with $\epsilon_r = 2.2$ demonstrates the best overall performance. The antenna operates in the 2.4 GHz band, making it appropriate for Bluetooth and Wi-Fi communication applications.

Paper ID: ICA6NT 263

ECHOBEAT+: AI-ENHANCED SMARTPHONE-BASED CARDIAC MURMUR SCREENING SYSTEM FOR RESOURCE-LIMITED SETTINGS

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ABSTRACT

Rheumatic heart disease (RHD) is especially common in rural and low-resource areas of developing countries like India. Worldwide, cardiovascular diseases (CVDs) continue to be the major cause of death. Access to cardiologists and advanced diagnostic tools is limited, even though early detection of heart murmurs is crucial for timely treatment. Current digital stethoscopes are not appropriate for rural use because they are expensive and often depend on cloud processing. This paper presents EchoBeat+, a lowcost smartphone-based cardiac screening system that uses artificial intelligence (AI) to automatically identify heart murmurs. The solution consists of the following components: low-cost stethoscope chest piece, smartphone microphone interface, and machine learning for offline classification. Using the MobileNetV2 model for preprocessing, transforming, or converting the cardiovascular signal recordings into Mel Spectrograms through the application of the convolutional neural network. TensorFlow Lite optimizes the system for mobile use, leading to low inference time and acceptable clinical performance with a smaller model size. For community healthcare, EchoBeat+ demonstrates that accessible, scalable, and affordable cardiac screening is possible.

Paper ID: ICA6NT 265

STRUCTURED LARGE SCALE DATA GENERATION

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ABSTRACT

The effectiveness of computer vision and deep learning models is highly dependent on the availability of large-scale, clean, and well-structured training data. However, most real-world web data exists in unstructured formats and often contains noise, duplicates, and inconsistencies, which negatively affect model performance and reliability. Manual data collection and preprocessing are time-consuming, error-prone, and difficult to scale for large applications. This paper proposes a structured large-scale data generation framework that automates the process of collecting, preprocessing, analyzing, and organizing image data into a unified and model-ready format. The system integrates domain-specific image acquisition with automated quality assessment, preprocessing, and feature extraction using advanced deep learning models. Object-level features are extracted using YOLO-based detection, semantic representations are generated using CLIP embeddings, and descriptive textual captions are produced using BLIP image captioning. These multimodal features are then combined into a structured dataset schema along with metadata and quality metrics. The proposed framework improves dataset consistency, scalability, and usability by transforming raw image data into standardized structured records suitable for training and evaluating machine learning and computer vision models. By automating the entire pipeline, the system reduces manual effort, enhances data quality, and supports reliable model development. This approach provides a scalable and efficient solution for structured dataset creation, enabling improved model performance, reproducibility, and intelligent data-driven applications.

Paper ID: ICA6NT 267

FINWISE: A PERSONALIZED FINANCIAL ADVISORY WEB PLATFORM

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ABSTRACT

FinWise is a personalized financial advisory web platform designed to provide smart and reliable investment recommendations in cryptocurrencies and stocks. Many individuals invest without adequate financial knowledge or expert guidance, leading to uninformed decisions based on peer influence or random online suggestions. FinWise addresses this gap by allowing users to input their investment amount and choose a preferred risk level such as low, medium, or high. Based on these inputs, the system generates customized investment suggestions along with clear reasoning and an expected holding period. The platform integrates real-time market data using APIs such as Coin Gecko, Yahoo Finance, and Alpha Vantage to ensure accurate and up-to-date recommendations. By analyzing market trends and price patterns, FinWise supports datadriven decision-making and simplifies financial planning for beginners and experienced investors alike. The proposed system aims to make investment guidance accessible, userfriendly, and cost-effective, helping individuals make informed financial choices with confidence.

Paper ID: ICA6NT 269

DESIGN OF PLC BASED HYDRAULIC MACHINE FOR 700 TON CURING PRESS

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ABSTRACT

A 700 Ton Hydraulic Curing Press is a big machine that is used a lot in the rubber and composite industries. It is used to shape and cure products under a lot of pressure and high temperature. The 700 Ton Hydraulic Curing Press uses a system to make a strong force that pushes down on the product with a force of up to 700 tons. This makes sure that the pressure is spread out evenly over the mold.

The 700 Ton Hydraulic Curing Press has pressure and controlled heat. This helps to make the rubber strong and durable. It also helps to make sure that the final product is the size and shape. The 700 Ton Hydraulic Curing Press is good, for making rubber products that need to be strong and last a time.

The system is made up of parts like a hydraulic cylinder, a hydraulic pump, an oil reservoir, control valves, heating plates, temperature controllers and an electrical control panel. The hydraulic power unit takes energy and turns it into hydraulic energy so it can move the ram up and down putting the right amount of pressure, on the mold. The temperature control systems keep the heat steady during the curing cycle so the material turns out right. The hydraulic power unit and the temperature control systems work together to make sure the system runs smoothly. The hydraulic cylinder and the hydraulic pump are parts of the hydraulic power unit. The temperature controllers and the heating plates are parts of the temperature control systems. The 700 Ton Hydraulic Curing Press enhances production efficiency, ensures product quality, reduces manual effort, and provides safe and reliable operation.

Paper ID: ICA6NT 270

AUTONOMOUS RESOURCE MANAGEMENT FOR DYNAMIC TRAFFIC CONTROL

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ABSTRACT

The rapid evolution of 6G communication networks is expected to enable ultra-low latency, massive device connectivity, and intelligent automation in smart cities. However, dynamic traffic congestion and fluctuating network loads pose significant challenges to efficient resource management. This paper proposes an AI-driven autonomous resource management framework for dynamic traffic control in 6G-enabled smart cities. The proposed system integrates traffic prediction using Long Short-Term Memory (LSTM) models and adaptive signal control through reinforcement learning. By dynamically allocating network bandwidth and optimizing traffic signal timing based on real-time congestion levels, the framework enhances traffic flow efficiency and reduces communication latency. A simulation-based model inspired by urban traffic conditions demonstrates the potential of the proposed approach in improving resource utilization and minimizing waiting time. The study highlights how AI-native 6G networks can support intelligent and self-optimizing urban transportation systems.

Paper ID: ICA6NT 272

SMART ENVIRONMENTAL MONITORING AND CARBON DETECTION USING IOT

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ABSTRACT

Climate change is a major global issue caused by increasing greenhouse gas emissions from human activities and industries. Monitoring carbon footprint levels is essential to reduce environmental impact. However, many existing systems depend on manual input and lack real-time accuracy.

This paper proposes an IoT-based Carbon Footprint Tracker for real-time environmental monitoring. The system uses an Arduino microcontroller integrated with sensors such as MQ-135 for air quality detection, DHT11 for temperature and humidity measurement, and SCT-013 for energy usage sensing. The collected data is analyzed and transmitted to the cloud using the ESP8266 Wi-Fi module. Visual alerts are provided through LED indicators to indicate safe and warning emission levels.

The proposed solution is low-cost, scalable, and supports awareness for sustainable living.

Paper ID: ICA6NT 275

AI DRIVEN SMART WASTE MANAGEMENT SYSTEM WITH REAL TIME MULTISENSOR, MONITORING, AUTOMATED COMPRESSION AND WASTE GENERATION FORECASTING

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ABSTRACT

The rate of urbanization has resulted in an unprecedented increase of the volumes of the municipal solid waste generating such challenges as full bins, ineffective collection patterns, and environmental pollution. The conventional waste management systems were based on established routes as well as manual inspections which led to inefficient management of resources and increase in costs of operation. The proposed paper presents an AI-based smart waste management solution, which will combine multisensor real-time monitoring, automated compression, and predictive forecasting of waste. The conditions of the bins are constantly monitored and reported using ultrasonic, load, gas, and temperature directional sensors, and an internet of things allows real-time data like data aggregation to be offered to a central platform. Machine learning models interpret previous and real-time information to predict it to guide proactive planning of collection. Automated compression enhances the bin and minimizes the collection period. Through experimental assessment, the monitoring accuracy is found to be better, routing is optimized, and overflow incidents reduced, which proves the effectiveness of the system, its scalability, and its applicability to sustainable management of waste in cities.

Paper ID: ICA6NT 276

EARLY DETECTION OF BREAST CANCER USING MULTI-MODAL IMAGING & DNA BASED GENOMIC ANALYSIS

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ABSTRACT

Early detection of breast cancer plays a crucial role in reducing mortality rates and improving patient survival outcomes. Traditional diagnostic approaches often rely on single modality imaging techniques, which may result in limited accuracy and higher false- positive or false-negative rates. This paper proposes a multimodal deep learning framework for early breast cancer detection by integrating medical imaging data and DNA-based genomic analysis. The system utilizes EfficientNet-based feature extraction combined with an External Attention Transformer to capture both local and global contextual features from mammogram and histopathological images. Genomic biomarkers are incorporated to enhance predictive performance and support personalized diagnosis. The proposed model is trained and validated using standard evaluation metrics such as accuracy, precision, recall, and F1-score, demonstrating improved classification performance compared to conventional methods. A user friendly web-based interface is developed to enable real-time image upload and automated prediction of benign or malignant conditions. Experimental results indicate that multimodal fusion significantly reduces misclassification rates and enhances diagnostic reliability. The proposed framework provides an efficient, scalable, and clinically deployable solution for intelligent breast cancer screening and early detection.

Paper ID: ICA6NT 277

DESIGN AND IMPLEMENTATION OF INFUSION PUMP USING ADDITIVE TECHNOLOGY

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ABSTRACT

An additive technology approach of designing and producing an infusion pump is proposed to meet the increasing needs of affordable, tailor-made and quick-to-develop medical equipment. Traditional infusion pumps are very costly, complicated to produce and hard to adjust to unique clinical needs. In this paper, additive manufacturing, in particular, 3D printing, is applied to form the structural elements of an infusion pump, allowing quick prototyping and flexibility during design. The system has a microcontroller-powered control device, a stepper motor-powered pumping solution, flow regulation sensors, and safety alarms to guarantee precise and controlled drug administration. It is also focused on attaining the accurate flow rates, reducing the number of mechanical errors, and promoting patient safety by the means of real-time monitoring and automatic fault detection. Additive technology greatly lowers the cost of production and development time besides being easily customized to fit other medical uses. As the experimental assessment proves, the proposed infusion pump provides adequate accuracy and reliability of fluids delivery in the case of low-to-mediocre flow clinical uses. These findings suggest that additive manufacturing can be utilized successfully with regards to the creation of critical medical equipment, specifically in low resource environments, and during emergencies. This paper emphasizes the possibilities of having embedded systems and additive technology as a part to enable affordable healthcare innovation and scalable development of medical devices.

Paper ID: ICA6NT 278

ENVIRONMENTAL PREDICTION AND MEDICINE REMINDER FOR ASTHMA PATIENTS USING WEAREBLE DEVICE

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ABSTRACT

Asthma is often exacerbated by factors arising from the environment, like temperature changes, polluted air, etc. Identifying these environmental triggers before they cause a person to have an episode of asthma can assist in preventing or managing an asthma attack. To this end, this proposal describes an effective method for wearable continual monitoring of asthma using environmental sensors along with predictive analytics. An Internet of Things (IoT) based device that can measure temperature, humidity, and airborne pollutants will be embedded in such a way as to provide as much real time data as is needed by the user in terms of the state (safe/unsafe) of the user's environment. Predictive algorithms will analyse the data collected to predict potential hazardous conditions prior to their actually affecting the user. Upon predicting the likelihood of a hazardous condition occurring, the wearable device will immediately inform the user either by way of alerting vibrations or via a mobile notification, providing the user with the opportunity to take appropriate pre-emptive action. The device will also contain a built-in medication reminder to alert the user at the appropriate time to take their scheduled medication or utilize their inhaler, thereby minimizing the opportunity for missed doses. Over time, by providing users with the tools needed to record and analyse the environmental trigger patterns that have affected them, users will be able to gain greater knowledge about their potential triggers, leading to more effective long-term management of their asthma. The combined capability of an intelligent wearable device will provide individuals with a reliable, cost effective, and simple way to detect their likelihood of a possible asthma attack sooner, adhere to their medications more consistently and enhance their personal safety. The overall result will be the promotion of better respiratory health outcomes.

A Blockchain-Enabled Decentralized Framework for Real-Time Weed Detection Using a Hybrid YOLOv8-CNN Architecture

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ABSTRACT

Uncontrolled weed growth significantly reduces crop yield and increases operational costs due to excessive and non-targeted herbicide application. Traditional weed management methods rely on manual inspection or uniform chemical spraying, which are labor-intensive, inefficient, and environmentally harmful for large-scale farming. Although deep learning techniques have improved automated weed detection, most existing systems operate on centralized architectures that lack transparency, data traceability, and trust among stakeholders.

This paper proposes a blockchain-enabled decentralized framework for real-time weed detection using a hybrid YOLOv8-CNN architecture. High-resolution field images captured via IoT-enabled cameras or UAVs are processed by a CNN backbone for hierarchical feature extraction, while YOLOv8 performs real-time weed localization and classification. The hybrid model enhances detection performance under varying illumination, background complexity, and crop growth stages.

Detection outputs, along with spatial and temporal metadata, are recorded as immutable transactions on a blockchain network to ensure data integrity, transparency, and traceability. Smart contracts automate validation, alert generation, and controlled data access among farmers, agronomists, and regulatory authorities. Experimental results demonstrate high detection accuracy with low inference latency, while blockchain integration introduces minimal computational overhead. The proposed framework offers a secure, scalable, and intelligent solution for precision agriculture, enabling targeted herbicide application, reduced chemical usage, and improved crop productivity.

Keywords: YOLOv8, Convolutional Neural Network (CNN) Backbone, Weed Detection, Blockchain, Precision Agriculture

WEARABLE POSTURE AND BONE ALIGNMENT MONITORING DEVICE USING ESP 32

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ABSTRACT

A Chronic body pain, spinal abnormalities, musculoskeletal diseases are all mostly caused by poor posture, which is exacerbated by prolonged sitting and incorrect body alignment throughout daily tasks. Based on athned ElnStPe3rn2e mt oicfrTochoingtrsoller technologies, this project offers a wearable posture and bone alignment monitoring gadget. The device continuously tracks body posture in real time by placing 1. motion and orientation sensors at strategic body parts like the neck, back, and hip. Using preset threshold levels, the gathered sensor data is processed to identify improper postures such as slouching, spine bending, and aberrant neck tilt. Through vibration motors and buzzer alerts, the system rapidly corrects posture when it detects it, assisting the user in making the necessary adjustments. Furthermore, an IoT platform receives posture data wirelessly via ESP32 for longterm ergonomic study, data logging, and remote monitoring. Affordable, portable, and T healthcare, and rehabilitation.

SMART SANITARY VENDING MACHINE WITH MONITORING AND ALERTS

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ABSTRACT

A smart sanitary vending machine is represented by paper. Sanitary pad dispensers that accept both coin and QR code payments. It has an ESP32 controller to manage the vending machine operation and an infrared sensor to keep an eye on the stock level. When the stock falls below a certain threshold or maintenance is required, a GSM module notifies the user. The technology will result in prompt refilling, convenience for public spaces, schools, and institutions, in addition to convenience. The ESP32 incorporates microcontroller functionality into a more accessible form.

AGRIHUB: A PHYGITAL PLATFORM FOR CONTRACT FARMING AND DIRECT AGRICULTURAL MARKET INTEGRATION

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ABSTRACT

Agriculture remains the backbone of the Indian economy, yet farmers face significant challenges including price fluctuations, middlemen exploitation, delayed payments, and lack of direct market access. Traditional supply chain systems create inefficiencies that reduce farmer profitability and transparency. This paper presents AgriHub, a phygital contract farming and direct market integration platform that combines physical agricultural activities with a digital marketplace infrastructure. The system enables farmers to register crops, establish digital agreements with buyers, and ensure transparent contract cultivation. Developed using the MERN stack (MongoDB, Express.js, React.js, Node.js), AgriHub provides modules for farmer registration, buyer interaction, contract management, and administrative monitoring. The proposed system reduces dependency on intermediaries and ensures secure, traceable transactions. Experimental evaluation of the prototype demonstrates improved communication efficiency, faster agreement processing, and enhanced supply chain transparency. AgriHub contributes to sustainable agricultural development by integrating digital technology into traditional farming ecosystems, aligning with the emerging concept of phygital systems.

Paper ID: ICA6NT 285

FAULT DETECTION OF GEARBOX VIBRATION SIGNAL ANALYSIS BY USING BAND PASS FILTER

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ABSTRACT

Vibration analysis offers the widest coverage of all failure prevention techniques. Virtually any change in the mechanical condition will cause a change in the vibration signature produced by the machine. This paper proposes a novel method for identification of gear fault from the low-frequency modulated vibration signal, based on Band pass Filter. Here, a new approach to fault diagnosis is proposed based on time-frequency signal analysis techniques. Bandpass filter is used to remove the fault race. 94 % accuracy is obtained from the classification result. Experimental results show that these methods can provide significant improvement in diagnostic capabilities over existing vibration analysis techniques.

LIFE EXPECTANCY FORECASTING USING MACHINE LEARNING

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ABSTRACT

Life expectancy refers to the average number of years a person is expected to live. It is one of the most important indicator used to evaluate the overall health and development of the nation. Accurate prediction of life expectancy helps government and healthcare organisations to design effective policies, allocate medical resources, and improve the quality of citizens.

Traditional statistical techniques used for life expectancy. In recent years, machine learning techniques have shown strong potential in solving complex prediction problems across healthcare, finance, and social sciences. These models can learn hidden patterns from large datasets and provide accurate forecasting results. In this paper, a machine learning based framework is proposed for predicting life expectancy using global health and economic indicators. Several regression based and ensemble based models such as linear regression, decision tree, support vector machine, random forest, and XGboost are implemented and compared.

A COMPACT MULTIBAND IMPLANTABLE ANTENNA FOR INTRACRANIAL WIRELESS POWER TRANSFER APPLICATION

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ABSTRACT

This paper presents the design and analysis of a compact implantable antenna for intracranial pressure (ICP) monitoring, operating at 3.3 GHz for efficient wireless telemetry and power transfer in short-range biomedical implants. Embedded in a brain-tissue-equivalent phantom and encapsulated in low-loss biocompatible dielectric, it emulates realistic conditions to reduce near-field tissue coupling. Performance is evaluated via impedance matching, radiation characteristics, and tissue field distribution. Safety is assessed by 1 g SAR analysis per IEEE/IEC 62704-1, with normalized values ensuring compliance for implantable devices. Simulations confirm reliable operation with acceptable tissue interaction, suiting intracranial monitoring.

AI DRIVEN DEFECT MANAGEMENT IN AGILE SCRUM

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ABSTRACT

Managing defects early is very important for improving software quality in Agile Scrum projects. This paper explains how machine learning can be used to predict defects at an early stage by analyzing past sprint data such as defect records, team performance details, and sprint completion information. Before using this data, it is carefully cleaned and prepared to make sure it is accurate and reliable.

The study uses three machine learning models—Random Forest, Gradient Boosting, and Neural Networks—to predict possible defects. These models are evaluated using common performance measures like accuracy, precision, recall, and F1-score. Among all the models, Neural Networks give the best results, with 94% accuracy, 90% precision, 94.7% recall, and a 92.3% F1-score.

When machine learning is applied within the Agile Scrum process, defect detection improves significantly. The defect detection rate increases from 62.1% to 80.4%, and the time required to fix defects is reduced from 3.32 days to 2.56 days. In addition, the overall number of defects drops from 13.6% to 8.2%.

The paper also compares these advanced models with traditional approaches such as Decision Tree and Naïve Bayes. These older models perform poorly because they struggle to handle complex relationships between sprint data factors. Overall, the results show that using machine learning for defect prediction makes Agile Scrum more efficient, improves software quality, and supports better decision-making during development.

Keywords—Machine Learning, Agile Scrum, Predictive Defect Management, Software Development, Defect Prediction, Data Quality, Model Interpretability, Neural Networks.

PAPER ID: ICA6NT 294

NATURAL LANGUAGE PROCESSING-BASED TEXT SIMILARITY OF SCIENTIFIC ABSTRACTS

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ABSTRACT

The number of scientific research papers available online is increasing rapidly. Identifying similar research work manually has become difficult and time-consuming for researchers. Text similarity techniques play an important role in comparing documents and understanding their content. This project focuses on measuring similarity between human and AI generated scientific abstracts using Natural Language Processing techniques. The proposed system performs text preprocessing in which the text is preprocessed to improve accuracy, feature extraction to extract meaningful features, and similarity calculation using multiple NLP models. TF-IDF is used for finding important words, Word2Vec understands the meaning of words, and BERT understands the meaning of complete sentence. Therefore this system helps in handling a large number of research abstracts easily. It reduces the need for manual checking and saves time for researchers. The results show that semantic-based models provide better similarity detection compared to traditional methods and system can be used for basic research analysis and document comparison.

REAL-TIME PHRASE-LEVEL SIGN LANGUAGE RECOGNITION USING ADAPTIVE SPATIO-TEMPORAL REGION PROPOSAL AND GCN-BASED SEQUENCE CONSENSUS

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ABSTRACT

Meaningful communication with the approximately 360 million people worldwide affected by disabling hearing loss remains a significant hurdle in human-computer interaction. While previous vision-based Sign Language Recognition (SLR) systems have made strides, they often rely on rigid, pixel-heavy architectures that struggle under the weight of real-world environmental noise, such as shifting illumination or cluttered backgrounds. In this paper, we propose a reformulated framework designed for the complexities of phrase-level recognition. Our approach centres on the Adaptive Spatio-Temporal Region Proposal (A-STRAP) algorithm for robust skeletal landmark normalisation, paired with a Graph Convolutional Network (GCN) that treats the human skeleton as a dynamic, non-Euclidean graph. By integrating Long Short-Term Memory (LSTM) layers with a novel Phrase-Level Sequence Consensus (PL-SC) mechanism, we achieve a high degree of stability across variable-length gesture sequences. Experimental validation across standard benchmarks (WLASL, AUTSL) and conversational datasets confirms a peak accuracy of 95.1 % at 45 frames per second (FPS), outperforming standard CNN-LSTM baselines with high statistical significance ($p < 0.001$) over standard CNN-LSTM baselines.

HYBRID DEEP LEARNING AND IMAGE PROCESSING APPROACH FOR BANK CHEQUE VALIDATION

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ABSTRACT

This project presents an intelligent and automated bank cheque verification system that uses deep learning, image processing, and Generative AI to improve accuracy and reduce manual effort. This system verifies important cheque details such as handwritten digits, printed text, and signatures through a user-friendly Django-based web interface. A CNN model is used for handwritten digit recognition and achieves high accuracy on the IDRBT cheque dataset. Image preprocessing techniques like grayscale conversion, Gaussian blurring, adaptive thresholding, and resizing are applied to enhance image quality and extract important regions. For printed text extraction, OCR is used for printed text extraction. Gen AI is used to correct the extracted text and improve the accuracy of extracted text. For signature verification, SIFT is used for feature extraction along with an SVM classifier to check the signature originality.

XAI FRAMEWORK FOR CROP DISEASE ALERTS

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ABSTRACT

Remote-sensing and artificial intelligence have become key components of precision agriculture to enhance crop monitoring, but current technologies do not have interpretability, scalability, and health assessment combined. In this paper, an end-to-end explainable crop health monitoring system is proposed that produces spectral features and uses them to classify crops and assess vegetation stress using a deep neural network inspired by Sentinel-2. There were thirteen engineered features, such as Normalized Difference Vegetation Index (NDVI), Normalized Difference Red-Edge Index (NDRE), spectral ratios, and band-difference measures, that were calculated using simulated B4 (Red), B5 (Red Edge), and B8 (Near Infrared) spectral bands in order to improve discriminative capabilities between wheat, rye, barley and forages. The model demonstrated significant engagement in classification accuracy over the baseline methods, and the addition of the Gradient-weighted Class Activation Mapping (Grad-CAM) offered useful interpretability by determining the most significantly important spectral elements to every prediction. A NDVI/NDRE thresholds-based health assessment module that uses contextual weather data also made it possible to determine the condition of crop stress accurately. The system also produces multi-language PDF reports containing classification results, health indicators, pictorial descriptions, and remediation measures. Overall, the suggested framework proves the efficiency of integrating spectral science, deep learning, and explainability to provide a powerful, user-friendly system to provide scalable and transparent crop health diagnostics.

EMERGENCY VOICE-ACTIVATED SOS SAFETY FOR WOMEN

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ABSTRACT

Women's safety remains a significant societal concern, particularly in developing countries where emergency response delays and network limitations reduce the effectiveness of existing safety systems. Many currently available wearable devices rely heavily on GSM and GPS modules, which increase hardware complexity, cost, and power consumption. This paper presents a smartphone-assisted, voice-activated wearable safety device designed to provide intelligent emergency detection and rapid response with minimal hardware requirements. The proposed system uses an ESP32-C3 microcontroller integrated with a MEMS microphone to continuously monitor distress-related voice patterns. Instead of performing full speech recording, the device analyzes acoustic features such as loudness, repetition, and stress patterns to identify potential danger situations. Upon detecting a validated distress condition, the ESP32 transmits a trigger signal to a companion mobile application via Bluetooth. The mobile application then retrieves real-time GPS location using the smartphone's internal positioning system and sends emergency alerts through cloud-based communication services such as Twilio. Additionally, the application records a short emergency audio clip (5-10 seconds) for evidence preservation and stores data locally if network connectivity is unavailable.

Paper ID: ICA6NT 308

EMBEDDED-BASED FIBER OPTIC INTERFACE FOR AIRPORT PASSENGER BOARDING BRIDGE FAULT AND EVENT DIAGNOSTIC SYSTEM

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ABSTRACT

A jet bridge (also called an aerobridge) is a transportable bridge between the airport terminal and an aircraft, which allows people to exit and enter safely in a weather-protected climate-controlled area. Conventionally, the aerobridges are manually controlled by trained individuals, and the Airport Operational Control Centre (AOCC) does not monitor them in real-time. The three are sufficient in the case of low traffic but with the increased number of worldwide air travel, automation is required to provide high efficiency, accuracy and safety. The proposed Aerobridge Monitoring System BP presents closed loop automated monitoring and control system. The aerobridge has sensors that offer real-time position, slope, docking alignment, and overtravel limits. This is sent to the AOCC through optical fiber communication and there are no risks of electrical breakages and other interference problems like EMI and RFI. The system combines embedded system, PLCs, optical isolators, and visualization software in order to provide operational accuracy, as well as, passenger safety. Its effectiveness and scalability in terms of passenger traffic increase were confirmed by real time testing in Chennai International Airport. Altogether, Aerobridge Monitoring System is a trustworthy and effective automation system that transforms airports infrastructure and addresses the increased needs of air travel.

EMOTION RECOGNITION USING EYE MOVEMENT ANALYSIS WITH MACHINE LEARNING

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ABSTRACT

This paper focuses on identifying human emotions by analyzing eye expressions, as eyes play a vital role in revealing emotional states. We present a novel approach that captures and processes live image sequences to study subtle eye movements and patterns. By continuously tracking these expressions, the system performs dynamic analysis to recognize emotions in real time. The proposed method leverages modern computational techniques such as Machine Learning and Convolutional Neural Networks to understand the temporal changes in eye behavior. In addition to emotion detection, the system also translates the recognized emotions into meaningful descriptions, improving clarity and interpretability. This approach enables accurate, real- time emotion recognition while providing a clearer representation of human emotional states.

HEART DISEASE PREDICTION USING EFFICIENT NETB0: DEEP LEARNING BASED ECG ANALYSIS APPRAOCH

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ABSTRACT

As cardiovascular diseases continue to account for a substantial proportion of global mortality, improving the accuracy of early diagnostic strategies has become increasingly important. This study presents an optimized deep learning model for heart disease prediction using ECG image classification. Built on EfficientNet-B0, the model is trained on a diverse dataset containing ECG images representing myocardial infarction, arrhythmia, and normal heart conditions. The model uses transfer learning, data augmentation, and supports real-time inference, achieving strong classification performance. Evaluation metrics such as accuracy, confusion matrix, classification report, and ROC curves confirm its effectiveness in identifying cardiac abnormalities. This work is compared with a study by Mayourian et al. (2024), which developed an AI-ECG model using 1D ECG signals to predict 1- and 5-year mortality in congenital heart disease patients. Their residual CNN model achieved an AUROC of 0.79 and c- index of 0.74. Unlike their focus on mortality risk, our model targets real-time disease classification using 2D ECG images. The proposed model is lightweight, scalable, and cost-effective—ideal for telecardiology and low-resource settings. It offers an alternative diagnostic approach with real-time image-based prediction. Future improvements include adding attention mechanisms, ensemble learning, and multimodal data to enhance accuracy and clinical impact.

Paper ID: ICA6NT 319

A FACE ANTI-SPOOFING DETECTION SYSTEM USING TRANSFORMER-INSPIRED SELF-ATTENTION MECHANISM

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ABSTRACT

Face recognition systems are increasingly adopted these days in numerous ways in security-sensitive applications such as payment authentication, device unlocking, and surveillance. Despite their growing deployment, these systems remain vulnerable to various face spoofing attacks, including print, replay, partial mask, and full mask presentations. Most existing face anti-spoofing methods approach the task as a binary classification problem, often neglecting the need for fine-grained identification of specific spoof types. In this work, we propose an advanced anti-spoofing framework which performs fine-grained multi-class classification using a Transformer-inspired design. To improve generalization under limited training data, we incorporate a VGG-based style-transfer network for data augmentation. Furthermore, a convolutional self-attention mechanism is integrated to effectively capture both local texture details and long-range dependencies essential for distinguishing among diverse spoofing patterns. A lightweight linear classifier is employed to categorize input images into five classes: real, print attack, replay attack, partial mask, and full mask. The proposed method is evaluated on several benchmark datasets, including OULU-NPU, SiW, WMCA, and CeFA, where it demonstrates superior performance in both accuracy and computational efficiency compared to existing approaches. By explicitly addressing spoof-specific characteristics within a unified detection model, our framework significantly enhances the robustness and reliability of face recognition systems in real-world applications.

Paper ID: ICA6NT 320

SMART AUTOMATED AI VOICE ASSISTANT PERSONAL ROBOT

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ABSTRACT

A tiny gadget listens closely, catching words with clear precision before figuring out what people mean. Sitting on a basic electronic base, it glides without effort, steering around barriers by sending out sound pulses that bounce back. As soon as a person speaks - no matter the tongue - the response forms fast, spoken right behind the original query. Information like headlines or forecast changes streams in nonstop, while known faces hear custom greetings said out loud. On most days, everything runs without trouble because glitches are rare. When tricky components could break, simple tools take over - handling tasks such as speaking responses or completing daily sequences. Sound moves through Livekit, coming and going instantly. Understanding shapes choices, powered by the Gemini API's ability to grasp context beyond isolated terms. Designed basic yet strong, it works just as well in a kitchen as it does in a classroom

Phishing URL Detection Using Deep Learning and NLP

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Abstract

Artificial Intelligence integrates machine learning and deep learning techniques to enhance cybersecurity systems by enabling intelligent threat detection and automated decision-making. Malicious URLs and phishing attacks pose significant threats by stealing sensitive information and distributing malware. The existing AFSADL-MURLC model combines GloVe embeddings, GRU, and Artificial Fish Swarm Optimization for URL classification. However, it mainly relies on static feature representation and lacks efficient dimensionality reduction mechanisms, limiting adaptability against newly generated phishing URLs. To overcome these limitations, we propose a hybrid deep learning framework integrating Recurrent Neural Networks (RNN) and Autoencoders. The RNN captures sequential dependencies in URL structures, while the Autoencoder performs feature compression and latent representation learning. The proposed system enhances detection accuracy, improves generalization capability, reduces false classifications, and enables real-time malicious URL prediction.

Paper ID: ICA6NT 325

TOWARDS PRACTICAL QUANTUM ADVANTAGE: AN EXPLAINABLE HYBRID MULTI-OBJECTIVE QML FRAMEWORK FOR DRUG DISCOVERY

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ABSTRACT

The promise of quantum computing in drug discovery remains largely theoretical due to hardware noise, limited qubit scalability, and the lack of deployable hybrid frameworks. This study proposes an explainable hybrid multi-objective Quantum Machine Learning framework to enable practical quantum advantage in early-stage drug discovery. The model integrates variational quantum circuits with classical deep neural networks to jointly optimize bioactivity, selectivity, and ADMET properties within a unified multi-task architecture. Molecular graphs are encoded through amplitude-based quantum feature maps, enabling high-dimensional representation learning while preserving structural dependencies. To improve interpretability, a quantum-aware attribution mechanism combining Shapley-based analysis and circuit-parameter sensitivity mapping identifies influential molecular substructures. The framework is evaluated on benchmark bioactivity and ADMET datasets against state-of-the-art Graph Neural Networks and transformer baselines. Results show improved generalization in data-constrained settings, enhanced Pareto-optimal candidate selection, and robustness under simulated NISQ noise, demonstrating feasibility for near-term quantum-assisted drug discovery

SECURE BLOCKCHAIN-BASED CERTIFICATE SYSTEM FOR REFUGEES

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ABSTRACT

The refugee crisis has forced many people to leave their homes, and during this process, they often lose important documents like identity and education certificates. Without proper documents, it becomes very difficult for them to access basic services such as education, healthcare, and employment. Traditional certificate systems are not fully secure, as documents can be lost, damaged, or forged. To address this issue, this paper proposes a Blockchain-based Certificate Generation and Validation System designed especially for refugees. The system uses MetaMask for creating a secure digital identity and Solidity for generating certificates, with a Django-based frontend for easy access and verification. Since the certificates are stored on blockchain, they are safe, transparent, and cannot be easily modified. This reduces manual errors and administrative workload. Overall, the system provides a reliable and scalable solution that helps refugees securely prove their identity and qualifications while supporting their integration into new societies.

DIABETIC RETINOPATHY DETECTION USING MACHINE LEARNING

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Abstract

Diabetic retinopathy (DR) is a progressive eye disease caused by prolonged diabetes, leading to damage in the retina and potentially resulting in vision loss. Early detection and regular screening are critical in managing DR, as timely intervention can prevent severe complications. One of the key indicators of DR progression is the presence of microaneurysms (MAs), which are tiny red spots on the retina formed by the outpouching of fragile blood vessels. Accurate identification and quantification of MAs from color fundus images can significantly enhance the detection and monitoring of DR. Existing systems primarily rely on Convolutional Neural Networks (CNNs) for automated DR diagnosis, which have demonstrated promising results. However, CNN-based approaches often lack interpretability and fail to capture the global contextual features necessary to fully understand complex retinal structures.

To address these limitations, this study proposes a novel DR detection scheme based on the Vision Transformer (ViT) architecture. The ViT model leverages self-attention mechanisms to capture both local and global features of retinal images, enabling more precise extraction of the area and number of MAs. Additionally, the integration of Explainable Artificial Intelligence (XAI) tools, such as Grad-CAM, allows visualization of model decisions, thereby enhancing transparency and building clinical trust in automated predictions.

Experimental evaluation of the proposed scheme demonstrates a diagnostic accuracy of 94%, outperforming several traditional machine learning and deep learning methods. By combining high accuracy with interpretability, this approach bridges the gap between fully automated DR detection and clinical acceptance, offering a practical solution for early screening and monitoring of diabetic patients. Overall, the proposed ViT-based DR detection scheme emphasizes not only technical performance but also the importance of explainability, aiming to support ophthalmologists in making informed, reliable decisions and ultimately contributing to the prevention of vision loss due to diabetic retinopathy.

ENHANCING ECG CLASSIFICATION USING GAN- AUGMENTED DCT FEATURES AND ATTENTION MECHANISMS

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ABSTRACT

The crucial task of Electrocardiogram (ECG) classification in identifying cardiac abnormalities and in accelerating the automated diagnosis of these abnormalities. However, real-world ECG data has commonly demonstrated severe class imbalance as well as noise and multifaceted temporal trends which make classification complicated to perform. Therefore, to minimize these shortcomings, we propose a solid deep learning framework named Enhancing ECG Classification Using GAN with DCT Features and Attention Mechanism. The model is meant to adapt one-dimensional ECG signals into a Discrete Cosine Transform (DCT) domain, allowing efficient spectrum extracts that represent both global and local frequency components. A patch-based self-attention mechanism is included to strengthen this further improves contextual representation by identifying patches of DCT features relevant to most of the segments. Further processing of this attention-guided representation is done using a multi-layer convolutional encoder with Conv-BatchNorm-SELU-MaxPool blocks, followed by a global average pooling (GAP) layer to minimize parameters, restore discriminative information, and suppress overfitting. A major contribution of this work is the integration of Generative Adversarial Networks (GANs) to create new minority ECG classes synthetically. GAN-based augmentation has an improved overall data balance, making the model's ability to identify rare cardiac events. The full framework is tested using the ECG5000 dataset, and then metrics measure performance on accuracy, precision, recall, F1-score and confusion matrix testing. Experimental results show that the proposed hybrid framework has a high classification accuracy exceeding 96%.

Paper ID: ICA6NT 339

Adaptive Koch-Curved LPDA Antenna Design With Element-Wise Fractal Height Tuning

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ABSTRACT

Log-Periodic Dipole Arrays (LPDAs) are commonly used in systems that need to receive or sense over a wide range of frequencies. However, traditional straight-dipole designs often have problems like uneven beamwidth, changes in gain, and poor use of the antenna's surface as the frequency changes. These issues happen because each dipole part doesn't contribute equally to the electromagnetic field across the entire frequency range. In this study, a new type of LPDA is introduced, called an adaptive Koch-curved LPDA. This design uses fractal shapes, but only on the dipoles that are most important for performance, and each of these modified dipoles has its own specific height adjustment based on Koch geometry. Unlike fully fractal designs, this method keeps the structure simple while allowing better control over how current flows and the effective length of each element. The antenna was created and tested using full-wave simulations in CST Studio Suite, covering the 2 to 6 GHz range. The results show better impedance performance, with a very low reflection coefficient of about -44 dB at 5.23 GHz, and smoother performance across the wide range of frequencies.

The far-field radiation patterns also show more consistent beamwidth and less distortion compared to a regular LPDA of similar size. These improvements come from the gradual shift in the active part of the antenna and better current flow, which is made possible by adjusting the height of each element. This design is ideal for use in wideband radar receivers, electronic warfare systems, and multi-band sensing applications where consistent radiation properties and reliable wideband performance are essential.

Paper ID: ICA6NT 340

A REVIEW ON QUANTUM MACHINE LEARNING

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ABSTRACT

Quantum Machine Learning (QML) is an emerging interdisciplinary field that integrates concepts from quantum computing and classical machine learning. This review paper focuses on understanding how quantum computational principles can be applied to learning models, the types of machine learning problems that are being explored, and the practical challenges associated with current quantum hardware. Rather than proposing new algorithms, this paper surveys existing approaches and categorizes them based on their methodology and feasibility on near-term quantum devices.

BLOCKCHAIN-BASED DONATION AND REPUTATION SYSTEM

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ABSTRACT

Blockchain technology provides a secure, transparent, and decentralised platform for managing financial transactions without relying on central authorities. Its key features, such as immutability, cryptographic security, and distributed ledger systems, make it highly suitable for funding applications, including charitable donations and crowdfunding. Existing blockchain-based funding systems commonly use Proof of Work (PoW) consensus to ensure transaction security and transparency. However, PoW suffers from limitations such as high energy consumption, reduced efficiency, and scalability challenges. To overcome these issues, this paper proposes a decentralised funding framework using Proof of Stake (PoS) to improve efficiency and reduce computational overhead. The system also integrates the InterPlanetary File System (IPFS) for secure and immutable storage of transaction receipts. Additionally, a reputation-based evaluation mechanism is introduced to ensure accountability and enhance trust among donors, trustees, and beneficiaries. The proposed framework improves transparency, security, and reliability, providing an efficient and trustworthy solution for decentralised funding platforms.

Fake Product Identification

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Abstract

The rapid growth of global e-commerce and interconnected supply chains has increased the risk of counterfeit products entering legitimate markets, threatening consumer safety and brand credibility. Ensuring product authenticity is therefore essential for maintaining trust and transparency. Traditional centralized verification systems lack complete visibility, are vulnerable to manipulation, and fail to provide comprehensive traceability among stakeholders. Recent studies highlight the effectiveness of blockchain-based traceability frameworks that leverage decentralized ledgers, smart contracts, and QR-based verification to enhance accountability. Platforms such as Ethereum and enterprise frameworks like Hyperledger Fabric have been explored to strengthen secure product tracking and tamper-resistant records. Integration of RFID and IoT technologies with distributed ledgers further improves fraud prevention and supply chain visibility. However, existing solutions still face scalability, interoperability, and real-time validation challenges. To address these issues, The system records key product lifecycle events on a distributed ledger and generates a unique verification code for each transaction, enabling consumers to independently verify authenticity. By combining decentralized transparency with practical validation mechanisms, the framework reduces counterfeit risks and supports a secure digital commerce ecosystem.

Dual-Layer Secure Messaging Framework Integrating AES Encryption and Image-Based Steganography

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Abstract

With the rapid increase in online communications, it is becoming increasingly important to ensure that private messages are kept secure from unauthorized users. This project is designed to help users achieve that by building a web application for secure messaging, using AES encryption to encrypt the message and then embedding the encrypted message in an image using the Least Significant Bit (LSB) method. In doing this, the message appears to be an ordinary image and there is no indication that it has any hidden content. The application uses Python and Flask as the development language and framework, and provides users with real-time messaging capabilities including authentication, controlled access to message content, timed deletion of messages, automatic deleting of messages after viewing, prevention against screenshot capture of messages, and a Dead Man's Switch for emergencies when deleting messages. The results of this work demonstrate that sensitive information can be protected through the use of these methods, achieving a 99.6% accuracy level for decryption and a 98.4% success rate for embedding the message in the image.

SECURE CLOUD STORAGE WITH DEDUCT-BASED DEDUPLICATION

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ABSTRACT

Cloud computing enables scalable remote data storage solutions. Data deduplication reduces storage overhead by eliminating duplicate data, but introduces security challenges in verifying ownership. This paper proposes a secure deduplicated cloud storage framework integrating Proof of Ownership (PoW) and Proof of Storage (PoS). PoW verifies file possession without full upload, while PoS ensures continuous ownership validation through periodic cryptographic challenges. The combined PoW + PoS approach enhances authentication, prevents unauthorized access, and preserves storage efficiency in cloud environments.

Real-Time Marine Oil Spill Detection

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Abstract

Marine oil spills cause severe environmental, ecological, and economic damage across coastal and offshore regions. Traditional oil spill detection techniques rely on manual interpretation of satellite imagery or classical machine learning models, which often suffer from limited accuracy and high false alarm rates. This paper proposes a real-time marine oil spill detection and monitoring system using the YOLOV11 deep learning architecture. The proposed system processes satellite and drone imagery to automatically detect and localize oil spill regions using bounding box regression and confidence scoring. The system enables faster disaster response and supports sustainable marine ecosystem management.

Hybrid Convolutional Model for Multimodal Deepfake Detection

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Abstract

Artificial Intelligence and deep learning techniques have enabled the creation of highly realistic synthetic media known as deepfakes, raising serious concerns regarding digital security and media authenticity. Most existing detection approaches rely on single-modal analysis, limiting their effectiveness against advanced multimodal manipulations.

This work proposes a Hybrid Convolutional Multimodal Deepfake Detection framework that jointly analyzes image, video, and audio data. The system employs transfer learning using VGG19 for image analysis, a CNN-RNN architecture for temporal video feature extraction, and a BiLSTM network for audio classification. By combining spatial and sequential learning mechanisms, the proposed framework improves detection reliability and adaptability across diverse media formats. The model demonstrates strong potential for applications in digital forensics, media authentication, and cybersecurity environments.

Secure Ranked Multi-Keyword Search over Encrypted Multimedia

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Abstract

Cloud computing provides scalable and cost-efficient storage solutions, but outsourcing sensitive information to third-party servers introduces serious privacy and trust challenges. Although encryption protects data confidentiality, it restricts efficient retrieval and searching of stored information. This paper proposes a blockchain-integrated secure framework that enables multi-keyword ranked search over encrypted cloud data. The system combines searchable encryption techniques with smart contracts and decentralized verification to guarantee confidentiality, integrity, and transparency. Secure indexes are generated to allow privacy-preserving search without revealing data content or query terms. A ranking mechanism ensures that the most relevant documents are retrieved efficiently. Blockchain technology records all operations immutably, preventing manipulation and ensuring fairness in search execution. Experimental analysis confirms that the proposed model achieves secure, accurate, and efficient data retrieval, making it suitable for modern cloud-based environments.

Paper ID: ICA6NT 354

Smart Cardless Transactions with Multi Factor- Authentication

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Abstract

In this rapidly changing world, ensuring secure transactions is more important than ever. This paper discusses how combining artificial intelligence with multi-factor authentication enhances the security of cardless transactions. Machine Learning plays a vital role by automatically detecting and preventing fraud activities, while MFA adds extra layers of security. This paper includes algorithms like Convolutional Neural Networks Algorithm, Advanced Encryption Standard Encryption Algorithm and Cosine Similarity for feature mapping. These layers include using mobile devices and advanced identification methods like facial recognition, making the process secure and user-friendly. Together, these technologies create a robust defence system that not only prevents fraud but also ensures smooth and successful transactions. This combination facilitates the way for future growth of digital finance, providing both safety and convenience.

IOT-BASED SEWER SAFETY AND GAS MONITORING SYSTEM

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ABSTRACT

Confined space accidents in urban sewer networks are a major problem, particularly in manholes, and frequently occur due to the accumulation of hazardous and poisonous gases such as hydrogen sulfide (H_2S), methane (CH_4), and carbon monoxide (CO), posing severe risks to sanitation workers [1], [2]. Conventional inspection methods are not only labour-intensive and slow but also needlessly expose personnel to life-threatening conditions [3]. To address these challenges, our solution, Smart Guardian, is a lightweight, portable, budget-friendly IoT gadget tailored for on-the-go sewer inspections, merging advanced sensing with smart connectivity [4], [5]. It features the MQ136 sensor for H_2S , the DF Robot MEMS unit for CH_4 , the ZE07-CO for CO, and the DHT22 for tracking temperature and humidity [1], [6], all routed through a CJMCU4051 8-channel multiplexer to the power-thrifty STM32L4 processor [7]. Readings appear on a 0.96-inch OLED screen, and the SIM800L GSM unit dispatches real-time data on a centralised dashboard and urgent text warnings to responders [8]. Running on a 3.7V 4000 mAh Li-Po battery with TP4056 recharging and a durable IP67 shell suited for tough conditions. The standout innovation is its streamlined, portable, low-energy multiplexer setup and energy-efficient multi-sensor architecture designed for real-time gas detection [6], monitoring manholes for hazardous conditions, such as gas buildup, blockages, and water levels, integrated GSM-GPS communication, and a compact IP-rated enclosure. Smart Guardian solution reduces the risk to sewage workers, minimises maintenance costs through predictive insights [9], and prevents environmental contamination. Its scalable, energy-efficient design ensures long-term sustainability and enhances worker safety, making it a valuable addition to modern smart city infrastructure [4], [10].

Paper ID: ICA6NT 356

Simulation-Based Stampede Prevention with Machine Learning and Explainable AI

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ABSTRACT

Incidences of stampede during mass public events still cause severe injuries and loss of lives largely because of uncontrolled human traffic, abrupt rush of crowds, and lack of preventative systems based on data. The present paper suggests a simulation model of crowd risk assessment that is aimed at anticipating and avoiding stampede-like scenarios prior to the occurrence of an event. Real-life venue structures like entry gates, corridors, pathways, and chokepoints are modelled using a pedestrian-flow simulation environment to investigate the behavior of crowd movement in the presence of different arrival rates and spatial configurations. Results of the simulation, such as density, speed difference, turbulence, and pressure, are processed with machine learning models to calculate zone-based stampede risk scores. Explainable AI methods are also used to provide justification on each risk score, pointing to the most important contributing factors, and enhancing trust, transparency, and accountability in the decision-making process. The system allows the authorities and event planners to see the development of congestion, to test alternative layouts, and to introduce preventive measures like addition of gates, expansion of critical pathways, or changing the directions of queues even before the real crowds come. The contribution of this work is a preventative decision support framework, which combines pedestrian simulation, machine learning, and explainable analytics to increase safety planning in large gatherings. The proposed solution will reduce the risk of stampede incidences by facilitating proactive crowd management instead of reactive management and enhance coordination between stakeholders in public safety and event management teams.

MindSpire-Wellness meets VR

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Abstract

This paper presents the design, implementation, and therapeutic potential of the MindSpire – Mental Wellness Game, a Unity-based interactive application developed for mental therapy and rehabilitation. By transforming repetitive motor exercises into engaging gameplay, the project supports upper limb mobility and fine motor skill recovery. We discuss the modular project structure, mechanics designed for therapy, and technical choices that ensure adaptability and sustained patient engagement. This work demonstrates how game technology can increase accessibility, motivation, and quantitative progress tracking in physiotherapy contexts.

DEEP LEARNING-BASED OPTIC CUP AND DISC SEGMENTATION FROM MULTI-MODAL RETINAL IMAGES

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ABSTRACT

Accurate segmentation of Optic cup and disc plays a crucial role in identifying glaucoma. The study presents an altered U-Net architecture with EfficientNetB3 (UE-Net) to accurately segment the optic disc (OD) and optic cup (OC) in color fundus images, a crucial diagnostic tool for glaucoma. The goal is to reduce computational costs and increase segmentation accuracy by eliminating pre- and post-processing processes. The proposed UE-Net architecture was tested against standard U-Net and a modified U-Net with VGG16, and it performed better than other existing models. The UE-Net variations outperformed other models on several criteria with significantly better accuracy. This model shows significant progress in the division of OC and OD, offering validated segmentation findings for early detection of glaucoma, a degenerative eye illness that causes permanent visual loss. This enhances the efficacy and uniformity of glaucoma screening protocols, allowing healthcare providers to initiate appropriate treatment regimens sooner and potentially preserving patients' eyesight and standard of living.

SKIN DISEASE IDENTIFICATION USING MATLAB

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ABSTRACT

Skin is the largest organ of the body and it is the protective layer of the human body which protects from microbes and guards the body against extremes of temperature, damaging sunlight, and harmful chemicals. It also releases antibacterial substances that prevent infection. Suppose that skin is affected with harmful diseases, especially in remote areas where a dermatologist is not available. We have to detect the disease is dangerous or not before it becomes worse and causes death. So to use in especially in remote areas we implemented an idea about skin disease identification using matlab and completely noninvasive to patient skin. In this based on image of the infected skin provided by the user, image processing is done and tells the user whether the infected portion of skin is harmful or not. Here we are using matlab software which compares original diseased image with user image and decides disease is harmful or not.

AI-Enabled Massive MIMO Integrated with RF-MEMS Technology for 6G Wireless Communication

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ABSTRACT

The sixth generation (6G) of wireless communication is expected to revolutionize the digital world by providing data rates up to 1 Tbps, ultra-low latency, and AI-native communication systems. It will operate in the terahertz (THz) spectrum, enabling massive connectivity for billions of devices.

6G aims to support advanced applications such as holographic communication, smart cities, autonomous systems, and intelligent IoT networks. Despite significant advancements in wireless communication, several challenges still exist in implementing efficient 6G systems.

These include high power loss in transmission, inefficiencies in RF switching, increased complexity in beamforming, and scalability issues in large antenna systems. Therefore, an optimized and intelligent architecture is required to overcome these limitations. Paper

Paper ID: ICA6NT 367

A DUAL ATTENTION AI MODEL FOR EMOTION RECOGNITION AND THERAPEUTIC COMMUNICATION

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ABSTRACT

In this paper, a Dual Attention framework is proposed to improve textual emotion recognition and AI-assisted therapeutic communication. Unlike traditional single-attention models, the proposed framework uses parallel semantic and affective attention mechanisms to highlight significant linguistic patterns and emotional intensity features. A transformer encoder is used to model contextual dependencies, and bidirectional sequence modeling is used to improve representation learning. The emotion classification result is used to guide an AI-assisted therapeutic response mechanism to produce empathetic and contextually relevant interactions. Experimental results show improved classification robustness and response relevance compared to traditional models. The proposed framework provides a scalable and adaptive solution for intelligent mental health support systems and conversational well-being applications NLP, Deep Learning.

AI Powered Enhanced Facial Recognition System for Law Enforcement Operations

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ABSTRACT

Artificial Intelligence (AI) enables machines to perform human-like tasks such as learning and decision-making, while Deep Learning (DL) uses multi-layered neural networks to learn complex patterns from large datasets. In this work, a U-Net-based deep learning architecture is proposed to overcome the limitations of conventional CNN-based facial recognition in real-world conditions. The encoder-decoder structure with skip connections preserves fine spatial details, improving performance under challenges such as illumination changes, pose variations, occlusion, background clutter, and aging. The model is further enhanced with attention mechanisms to focus on important facial regions, residual learning for stable training, and ensemble modeling to improve decision reliability. This hybrid approach increases robustness, segmentation accuracy, and generalization, making the system suitable for surveillance applications such as identifying missing persons and criminals.

Wild Fire and Smoke Detection using YOLO

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ABSTRACT

Wildfires cause serious damage to forests, wildlife, human life, and property. Early detection of fire and smoke is very important to reduce losses, but traditional methods such as manual monitoring and watchtowers are slow and not always reliable. To overcome this problem, this project presents an automatic fire and smoke detection system using deep learning and computer vision. In this project, a YOLO-based model is used to detect fire and smoke from images, videos, and live webcam input. The input frames are processed and given to the trained model, which identifies fire or smoke in real time. When fire or smoke is detected with sufficient confidence, the system automatically sends an email alert with the detected image attached. This helps in quick verification and faster response. Bounding boxes are drawn around the detected regions to clearly show the fire or smoke. The experimental results show that the system can accurately detect fire and smoke in different situations, including live webcam input. The proposed system can be used with CCTV cameras and drones and provides a simple, low-cost, and real-time solution for early wildfire detection. This system can help reduce response time and minimize damage caused by wildfires.

WiFi CSI-Based Earthquake Early Warning System Using Edge Analytics and Deep Learning

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ABSTRACT

The rapid advancements in wireless technologies have paved the way for utilizing Radio Frequency (RF) signals for intricate environmental sensing. While traditionally relied upon for human activity recognition, this paper proposes repurposing ubiquitous WiFi Channel State Information (CSI) for a low-cost, highly scalable Earthquake Early Warning (EEW) system. Conventional EEW systems depend on specialized, expensive seismic sensors, limiting their deployment in developing regions. In contrast, our proposed architecture leverages the fine-grained micro-vibration sensitivity of standard MIMO-OFDM WiFi signals in the 0.3–5 Hz frequency range to detect primary P-wave signatures. Extracted via the Nexmon firmware on a Raspberry Pi, the raw CSI data undergoes rigorous signal processing, including wavelet-based denoising and feature extraction. To handle the high-dimensional spatial-temporal data, a hybrid Convolutional Neural Network and Long Short-Term Memory (CNN-LSTM) deep learning model is deployed directly at the edge, ensuring ultra-low latency inference without cloud dependency. Furthermore, a LoRa-based backup communication module is integrated to guarantee alert transmission during catastrophic cellular network failures. Experimental evaluations demonstrate a detection accuracy of 94.3% with an average alert latency of 1.4 seconds. The proposed architecture shifts the paradigm of disaster management toward ubiquitous, low-cost IoT sensing.

AI in Daily Life: Everyday Exposure of Students to Artificial Intelligence

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ABSTRACT

Artificial Intelligence (AI) has transitioned from a specialized technological domain to an ambient and pervasive layer embedded within the everyday digital environments of students. Contemporary student life is structured through algorithmically mediated platforms that influence information access, communication practices, academic production, and cognitive processes. AI operates not merely as a tool but as an infrastructural presence that shapes epistemic pathways and learning behaviors. This paper develops a comprehensive theoretical and analytical exploration of AI as a lived daily reality for students, examining cognitive augmentation, algorithmic mediation, ethical tensions, authorship transformation, and pedagogical implications. It argues that the normalization of AI requires a paradigm shift in educational frameworks toward AI literacy, human-AI collaboration, and critical algorithmic awareness. The study proposes a conceptual model for integrating AI responsibly into academic ecosystems while preserving intellectual autonomy and ethical accountability.

Keywords:Artificial Intelligence, AI Literacy, Students, Algorithmic Mediation, Cognitive Augmentation, Digital Pedagogy, Academic Integrity

CNN-Driven Pest Prediction system for Smart and Sustainable Farming

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ABSTRACT

This study introduces a system designed to identify pests in crops and classify them as either beneficial or harmful. The project begins by providing a comprehensive overview of various pest identification methods, analyzing their strengths and limitations. To address the problem, a categorization approach is proposed that incorporates convolutional neural networks (CNN) to build the pest identification and classification model. The model was trained using a dataset containing images of different pest species. Extensive testing was conducted on a large dataset, and the system's performance was validated against multiple traditional classification models. The proposed framework achieved a classification accuracy of 90%, outperforming conventional methods. This research highlights agriculture's vital role in the economy and underscores the potential of advanced technologies in supporting sustainable farming practices.

SmartEdge-Based V2X Collision Prediction

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ABSTRACT

Road traffic accidents continue to be a major global safety issue, largely because many existing driver-assistance systems respond only after a hazardous situation has already developed. Vehicle-to-Everything (V2X) communication enables vehicles to exchange environmental and traffic information with surrounding entities, allowing hazards to be detected beyond the direct sensing range of onboard sensors. However, current solutions often suffer from fragmented sensing, limited predictive intelligence, and inefficient message dissemination strategies. This work presents SmartV2X-CP, an edge-enabled framework designed to support real-time collision prediction and efficient warning dissemination. The proposed approach integrates uncertainty-aware multisensor fusion using a hybrid Kalman filtering strategy, a deep learning trajectory prediction model combining LSTM and GRU networks, and a reinforcement-learning-based adaptive communication mechanism for V2V and V2I message dissemination. A dynamic Collision Probability Map (CP-Map) is also introduced to prioritize safety warnings. The framework follows a three-tier architecture consisting of vehicle onboard units, roadside infrastructure, and cloud services to enable low-latency processing and scalable deployment. Evaluation through SUMO-NS-3-PyTorch co-simulation under various traffic and weather scenarios demonstrates a 32% reduction in false positives, 2.7× improvement in warning lead time, and 41% decrease in dissemination latency compared to conventional V2X approaches. These results indicate that SmartV2X-CP provides an effective and scalable solution for next-generation cooperative road safety systems.

NeuSea: A Deep Reinforcement Learning-Based Multi-Objective Policy-Driven Neural Architecture Search

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ABSTRACT

CNNs often called Convolutional Neural Network's have become a mainstay of modern computer vision systems due to their greater ability in extracting hierarchical features of images. Although the Neural Architecture Search (NAS) techniques have been proposed to automate architecture designing of CNNs, the majority of current methods prioritize classification accuracy over computational efficiency and model complexity. This paper proposes a Deep Reinforcement Learning-based Adaptive Multi-Objective Policy-Driven Neural Architecture Search (AMO-PDNAS) system. During the architecture search process, a policy network successively chooses CNN architectural configurations, which are designed as a Markov Decision Process. The proposed method introduces an adaptive multi-objective reward mechanism that balances classification accuracy, model complexity, and other factors dynamically, as opposed to traditional NAS techniques that use static reward functions. In accordance with the MNIST benchmark dataset, the experimental evaluation on the manually created baseline CNN achieved 98.04%, where the suggested framework provides a competitive classification performance of 98.01%, while decreasing model parameters by 56% roughly. The results shows that the suggested framework successfully maximizes the compromise between computing efficiency and accuracy. For academic study, the lightweight approach makes automated architecture search more accessible, by enabling successful execution in computationally limited environments like Google Colab.

Keywords: Neural Architecture Search, Lightweight CNN, Deep Reinforcement Learning, Policy Gradient, MNIST dataset, Multi-Objective Optimization, Adaptive Reward.

Paper ID: ICA6NT 389

AI FOR MEDICAL IMAGE DIAGNOSIS: AN ATTENTION- GUIDED DEEP LEARNING FRAMEWORK WITH GRAD- CAM++ VISUALIZATION

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ABSTRACT

Artificial intelligence has emerged as a powerful tool for medical image diagnosis by enabling automated, accurate, and efficient analysis of complex imaging data. This paper presents an attention guided deep learning framework for medical image diagnosis that is capable of identifying normal and abnormal patterns while providing visual explanations for its decisions. The proposed system leverages deep neural networks to learn representative features from medical images and employs attention mechanisms to focus on clinically relevant regions. Anomaly detection is achieved by modeling normal image characteristics and identifying deviations without requiring extensive manual annotations. To enhance model interpretability, Grad CAM plus plus visualization is applied to generate heatmaps that highlight the regions influencing the diagnostic outcome. Experimental evaluation demonstrates that the framework effectively detects abnormalities across medical imaging data while offering transparent and explainable predictions. The proposed approach aims to assist healthcare professionals by improving diagnostic accuracy, reliability, and trust in artificial intelligence based medical systems.

Paper ID: ICA6NT 390

Hybrid Feature Selection with Adaptive Threshold Optimization for Efficient Machine Learning-Based Intrusion Detection

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ABSTRACT

With the booming growth of computers networks and the growing reliance on internet-based services, network security has emerged as an important issue. Traditional intrusion detection systems (IDS) mainly use signature-based or rule-based methods which are useless against zero-day attacks and new evolving cyber threats. To overcome these limitations, the present study proposes a Machine Learning-based Intrusion Detection System (IDS) incorporating a combination of hybrid feature selection and adaptive threshold optimization for enhancing the detection accuracy and decreasing the false positive rates. UNSW-NB15 dataset is used in the proposed system as a representative dataset representing the realistic modern network traffic in this study. First, the data preprocessing methods such as encoding, scaling, and class balancing are used. A hybrid approach to feature selection is then adopted which combines the Chi-Squared filtering with the Particle Swarm Optimization (PSO) in order to reduce the dimensionality and select the most relevant features. Several classifiers of supervised learning are trained and tested such as K-Nearest Neighbors, Decision Tree, Logistic Regression, and Random Forest. Furthermore, Adaptive Threshold Testing Algorithm (ATTA) are used for dynamic optimization of decision thresholds from F1-score performance. Experimental results show that the proposed approach improves intrusion detection performance and reduces the false alarms to a great extent. The compounding effect of combining hybrid feature selection and adaptive thresholding enhances efficiency and reliability of the system by meeting the criteria for actual deployment in the field.

Paper ID: ICA6NT 392

DESIGN AND IMPLEMENTATION OF AN IOT-BASED REAL-TIME SOIL NUTRIENT MONITORING SYSTEM USING ESP32 FOR PRECISION AGRICULTURE

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ABSTRACT

Efficient soil nutrient management is essential for sustainable agriculture and improved crop productivity. Traditional soil testing methods are time-consuming, expensive, and unsuitable for continuous monitoring. This research presents the design and implementation of an IoT-based soil nutrient monitoring system using an ESP32 microcontroller integrated with NPK, pH, soil moisture, and DHT11 sensors. The system performs real-time measurement of macro-nutrients (Nitrogen, Phosphorus, Potassium), soil acidity, moisture content, temperature, and humidity. Sensor data is processed and transmitted wirelessly to a mobile interface for instant monitoring and fertilizer recommendation. Experimental evaluation indicates improved efficiency, reduced operational cost, and near real-time response compared to conventional laboratory testing methods. The proposed system supports precision agriculture and sustainable land management practices.

Paper ID: ICA6NT 393

Digital Twin Health Assistant

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ABSTRACT

This paper introduces a Digital Twin Health Assistant based on the LLaMA.cpp implementation to offer smart and privacy-centric medical assistance on a laptop device. The solution models a patient's virtual counterpart through maintaining a digital twin profile that records medical reports, prescriptions, symptoms, and basic health info. Unlike cloud-dependent healthcare assistants, the proposed system carries out all the processing locally, thus ensuring data security, a quicker response, and reliable offline availability. The assistant can analyze the medical reports uploaded, interpret prescriptions, and produce simplified summaries that clarify a user's health status to them in great detail. Making use of LLaMA.cpp, which is a very light framework for executing large language models on local devices, the system does not refer to external servers and keeps sensitive patient data safe from unauthorized possession. The digital twin concept gets updated always with fresh inputs, thereby enabling long-term health-tracking and personalized recommendations. Additionally, the assistant helps in the systematic examination of medical documents by, for instance, pin pointing the primary attributes like diagnosis, test values, and medication details. The method put forward here indicates the capacity of digital twin technology coalesced with an offline large language model in elevating the aspects of accessibility, privacy, and efficiency in healthcare assistance. It provides a low-cost, easy-to-use option that would be a perfect fit for students, patients, small clinics, and healthcare researchers who need secure and smart medical document analysis without having to rely on the internet. **Keywords:** Digital Twin, Healthcare Assistant, LLaMA.cpp, Medical Report Analysis, Prescription Interpretation, Offline AI, Privacy-Preserving System, Intelligent Healthcare.

Paper ID: ICA6NT 394

METAMATERIAL-ENHANCED COMPACT MIMO ANTENNA FOR 6G VEHICULAR AND IOT COMMUNICATIONS

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ABSTRACT

The sixth generation (6G) of wireless communication is expected to deliver ultra-reliable, low-latency, and high-capacity services for emerging applications such as vehicular communication, Internet of Things (IoT), and ex-tended reality. However, antenna design at millimeter-wave (mmWave) and terahertz (THz) frequencies faces several challenges, including limited bandwidth, reduced gain, and high mutual coupling in MIMO configurations. To address these issues, this paper presents a metamaterial-enhanced compact MIMO antenna optimized for 6G applications. The pro-posed design integrates a metamaterial-based superstrate with a compact microstrip structure to achieve improved performance in terms of gain, bandwidth, and isolation. A 2×2 MIMO configuration is developed and analyzed using CST Microwave Studio, with key parameters such as return loss, voltage standing wave ratio (VSWR), gain, efficiency, and envelope correlation coefficient (ECC) evaluated. The simulation results demonstrate significant improvements compared to conventional microstrip antennas, with wider bandwidth, enhanced radiation characteristics, and reduced mutual coupling. Furthermore, a comparative analysis with state-of-the-art designs reported in recent literature (2023–2025) highlights the novelty and effectiveness of the proposed antenna. The results indicate that the proposed structure offers a promising solution for compact, high-performance antennas in 6G vehicular and IoT communications.

Paper ID: ICA6NT 395

Machine Learning Based Forecasting of Dynamic Pricing

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ABSTRACT

Online prices are often the first thing you think about when buying because they are easy to understand. Dynamic pricing is a well-known idea. Because they are simple to understand, online costs can be the most important factor to consider when purchasing. It is not novel to consider dynamic pricing. It is extremely advantageous to many online businesses and is commonly used to increase sales and profits. This work is the result of ongoing efforts to develop a universal framework using advanced machine learning technologies. It helps clients choose the most appropriate online store rather than the cheapest. This approach can be used by online stores that are out of stock. The aim is to help store owners set competitive rates by researching similar products sold online.

Paper ID: ICA6NT 397

Predictive Analysis of Smartphone Addiction Using Machine Learning

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ABSTRACT

Smartphone addiction has become a growing concern in recent years, with increasing numbers of people exhibiting symptoms such as excessive phone use, loss of productivity, and even physical and psychological health problems. As a result, there is a need to develop effective tools for predicting smartphone addiction and identifying those at risk. In this study, we built an ML model to predict smartphone addiction using survey data that included demographics, phone usage habits, and psychological factors such as stress, anxiety, and depression. The data was preprocessed by encoding categorical variables and normalizing numerical variables to improve learning efficiency.

The model was trained and evaluated using standard performance metrics and achieved high accuracy in predicting smartphone addiction. Key influencing factors included phone usage patterns, age, gender, and stress levels. This model can assist healthcare professionals in identifying at-risk individuals and help app developers design less addictive applications. Further research is needed to validate the findings using larger and more diverse datasets.

Paper ID: ICA6NT 398

Intelligent Pet Face Expression Monitoring to Identify Emotion and Emergency Alert System

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ABSTRACT

This project presents an intelligent Smart Pet Face Expression Monitoring system designed to automatically identify pet emotions and generate an emergency alert during abnormal situations. Monitoring pets continuously is challenging for owners, especially when they are away from home. To address this problem, the proposed system integrates computer vision and embedded artificial intelligence to analyze pet facial expressions in real time. A camera captures the pet's face, and a trained Convolutional Neural Network (CNN) model classifies emotional states such as happy, normal, sad, aggressive, and distressed. When the system detects stress or emergency-related behavior, it activates an alert command through the embedded controller to ensure immediate attention. The proposed solution improves pet safety, enables smart remote monitoring, and reduces the need for constant human supervision. Experimental evaluation indicates that the system achieves reliable emotion detection accuracy with efficient real-time performance, making it suitable for smart pet care applications.

Paper ID: ICA6NT 399

Intelligent Pet Face Expression Monitoring to Identify Emotion and Emergency Alert System

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ABSTRACT

This project presents an intelligent Smart Pet Face Expression Monitoring system designed to automatically identify pet emotions and generate an emergency alert during abnormal situations. Monitoring pets continuously is challenging for owners, especially when they are away from home. To address this problem, the proposed system integrates computer vision and embedded artificial intelligence to analyze pet facial expressions in real time. A camera captures the pet's face, and a trained Convolutional Neural Network (CNN) model classifies emotional states such as happy, normal, sad, aggressive, and distressed. When the system detects stress or emergency-related behavior, it activates an alert command through the embedded controller to ensure immediate attention. The proposed solution improves pet safety, enables smart remote monitoring, and reduces the need for constant human supervision. Experimental evaluation indicates that the system achieves reliable emotion detection accuracy with efficient real-time performance, making it suitable for smart pet care applications.

Paper ID: ICA6NT 400

A MACHINE LEARNING-BASED APPROACH TO DETECT PHISHING WEBSITES

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ABSTRACT

The Internet has emerged as an indispensable tool in both our personal and professional life in our modern day. As a direct consequence of this, the number of customers who make their purchases over the Internet is quickly increasing. Internet users may be vulnerable to a wide variety of web threats because of this fact. These threats may result in monetary loss, fraudulent use of credit cards, loss of personal data, potential damage to a brand's reputation, and customer mistrust in e-commerce and online banking. Phishing is a sort of cyber threat that may be defined as the practice of imitating a genuine website for the purpose of stealing sensitive information such as usernames, passwords, and credit card numbers. This research focuses on strategies for detecting phishing attacks. This study applies a machine learning approach to detect a phishing attack. As a result, this study is able to detect phishing with accuracy 94%.

Paper ID: ICA6NT 401

CRM DASHBOARD FOR CUSTOMER FEEDBACK SENTIMENT ANALYSIS AND KEYWORD EXTRACTION

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ABSTRACT

Customer Relationship Management (CRM) systems play a crucial role in maintaining customer interactions, managing business communication, and improving organizational decision-making processes. Traditional CRM platforms primarily focus on storing customer data and tracking transactions but lack intelligent mechanisms to analyze customer feedback effectively. With the rapid growth of digital communication channels such as emails, chat systems, and feedback portals, organizations require automated solutions capable of understanding customer emotions and opinions.

This paper presents an AI-enhanced web-based CRM system integrated with sentiment analysis and automated word extraction techniques to analyze customer interactions in real time. The system enables organizations to monitor customer satisfaction levels by identifying positive, negative, and neutral sentiments from textual communication. By applying Natural Language Processing (NLP) methods, meaningful keywords are extracted to highlight major customer concerns and business opportunities.

The proposed system improves decision-making by converting unstructured customer feedback into structured analytical insights. Machine learning models process customer messages submitted through CRM modules such as support tickets, feedback forms, and communication logs. The extracted insights assist administrators and managers in prioritizing customer issues efficiently.

The application is implemented as a scalable web platform using modern frontend and backend technologies integrated with AI processing modules. Sentiment classification algorithms analyze textual inputs, while keyword extraction techniques identify frequently occurring service-related terms. This combination enhances customer engagement tracking and service quality evaluation.

Experimental evaluation demonstrates improved response prioritization and faster issue resolution when compared with traditional CRM systems. The system also provides visualization dashboards that assist management teams in understanding customer behavior trends.

The proposed solution contributes toward intelligent business automation by integrating artificial intelligence into enterprise management software without requiring complex infrastructure. It bridges the gap between conventional web applications and data-driven decision systems.

The developed platform is highly adaptable and can be deployed across industries such as retail, healthcare, education, and service management organizations. Future work includes predictive analytics and conversational AI integration.

Paper ID: ICA6NT 402

Hand Gestures Based Virtual Mouse

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ABSTRACT

Human-Computer Interaction (HCI) has undergone a remarkable transformation with the evolution of computer vision, artificial intelligence, and intelligent sensing technologies. Traditional input devices such as wired and wireless mice, although widely used, still depend on physical hardware, power sources, and external connectivity components. These dependencies limit flexibility and increase maintenance requirements.

This research presents a gesture-based virtual mouse system that enables users to control cursor movement and mouse operations using hand gestures detected through a webcam. The system leverages HSV color space segmentation, image masking, contour detection, and coordinate mapping to convert hand gestures into mouse commands such as left-click, right-click, double-click, and scrolling.

The system is implemented using Python programming language with OpenCV libraries for real-time image processing. Experimental results demonstrate an average accuracy of 78–90% under controlled lighting conditions. The proposed model eliminates dependency on physical mouse devices and provides a natural, contactless, and cost-effective interaction method.

This work contributes toward future touchless computing systems and intelligent human-machine interfaces.

Keywords: Human-Computer Interaction, Gesture Recognition, Virtual Mouse, HSV Color Detection, OpenCV, Computer Vision

Paper ID: ICA6NT 403

Design and Implementation of an Automatic Window Control System Using a Custom PCB

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ABSTRACT

Air pollution has become a major concern in urban environments, especially inside vehicles where polluted air can enter through open windows and affect passenger health. This paper presents the design and implementation of an automatic vehicle window control system using a custom printed circuit board (PCB). The proposed system employs an MQ135 gas sensor to detect harmful gases and air pollution levels in the surrounding environment. The analog output from the sensor is processed by an ATmega328P microcontroller, which continuously monitors the air quality and compares the sensed value with a predefined threshold level.

When the detected pollution level exceeds the safe limit, the microcontroller activates an alert mechanism through an LED indicator or buzzer to notify the user. Simultaneously, the controller triggers a motor control circuit that automatically closes the vehicle window to prevent polluted air from entering the vehicle cabin. The system is implemented on a custom-designed PCB to reduce system size, improve reliability, and enhance hardware integration.

Experimental testing demonstrates that the proposed system responds effectively to changes in air quality and provides a reliable and low-cost solution for automatic window control in vehicles. The developed embedded system improves passenger safety and comfort by minimizing exposure to harmful gases and polluted air.

Paper ID: ICA6NT 405

Monitoring Modern Electrical Grid Monitoring: Substation Sentinel

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ABSTRACT

This project, titled "**Modern Electrical Grid Monitoring: Substation Sentinel**," proposes an intelligent, automated monitoring system for electrical substations using modern sensing, communication, and data analytics technologies. The Substation Sentinel is designed to continuously monitor key electrical and environmental **parameters** such as voltage, current, frequency, transformer temperature, oil level, load conditions, and fault indicators **in real time**. By integrating smart sensors, microcontrollers, and communication modules, the system enables real-time data acquisition and transmission to a centralized monitoring platform. Advanced data processing techniques are employed to detect anomalies, predict potential failures, and generate timely alerts for grid operators. This proactive monitoring approach significantly enhances system reliability, reduces downtime, and minimizes maintenance costs.

Paper ID: ICA6NT 406

Improving Solar Irradiance Forecasting Using Hyperparameter – Optimized Deep Learning Models

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ABSTRACT

The balance between electricity generation and demand is essential for reliable power system operation. With the rapid integration of renewable energy resources, especially solar energy, accurate forecasting has become increasingly important. Due to the random and intermittent nature of solar energy, the power grid faces challenges related to stability and reliability. Improving solar irradiance forecasting can help reduce uncertainty and improve planning and dispatch decisions. This paper presents a deep learning-based approach for solar irradiance forecasting using hyperparameter optimization. Different activation functions such as ReLU, Leaky ReLU, and ELU are analyzed with Bayesian and random search optimization techniques. The results demonstrate that hyperparameter optimization significantly improves forecasting accuracy and model performance.

Paper ID: ICA6NT 408

A PRIVACY-PRESERVING FRAMEWORK FOR FACE RECOGNITION SYSTEM

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ABSTRACT

Face recognition systems are widely used in security, surveillance, and authentication applications. However, the collection and storage of facial data raise serious privacy concerns. Traditional face recognition systems require uploading original facial images to servers, which may lead to misuse or unauthorized access. To address this issue, this paper proposes a hybrid obfuscation-based privacy-preserving face recognition system using feature compensation. In the proposed system, the original face image is first obfuscated using hybrid techniques such as Gaussian blur and pixelation to protect visual privacy. Instead of sending the original image to the server, only the obfuscated image and complementary feature representations are used for recognition. A deep learning-based model extracts facial features and compensates for lost information during obfuscation. The system ensures that facial identity can still be recognized accurately while preventing clear visual exposure of the original face. Experimental evaluation shows that the proposed approach maintains high recognition accuracy while significantly improving visual privacy protection. The system provides a practical and secure solution for privacy-aware face recognition applications.

Paper ID: ICA6NT 410

Q-DRUGX: QUANTUM-ENHANCED MACHINE LEARNING FOR MOLECULAR PROPERTY PREDICTION

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ABSTRACT

In early-stage drug discovery, one of the main reasons for high costs and failed compounds is the detection of toxicity, poor solubility, and unfavorable ADMET characteristics; these have previously not been detected until toward the later stages of drug discovery. Although machine learning methods have shown promise in improving the prediction of molecular properties, the implementation of Quantum Machine Learning (QML) is mostly based on experimental results. In this paper, a fully software-based hybrid quantum and classical framework is proposed for the prediction of molecular properties, called Q-DrugX. The program uses various datasets for the prediction of molecular properties, including Tox21, ClinTox, and ADMET datasets; these results can be achieved through ECFP fingerprint encoding and using RDKit-based physicochemical descriptors. In

addition, these descriptors need to be normalized and dimensionality-reduced before conducting the experiment. The program is completed with the implementation of a quantum-based classifier called a quantum circuit. The results can be achieved using simulators to compare the results of a quantum machine learning model. Moreover, the results can be implemented over a web-based platform.

Paper ID: ICA6NT 414

REINFORCEMENT LEARNING BASED INTELLIGENT FINANCIAL TRADING SYSTEM

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ABSTRACT

Financial markets are dynamic and complex environments characterized by volatility and uncertainty. This paper presents a reinforcement learning based intelligent trading system capable of autonomously learning optimal strategies. The agent interacts with a simulated market environment and makes Buy, Sell, or Hold decisions based on technical indicators such as Moving Averages and RSI. Experimental evaluation demonstrates consistent portfolio growth and improved cumulative rewards over training episodes.

Paper ID: ICA6NT 417

A Machine learning approach for customer churn prediction

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ABSTRACT

Customer churn prediction is a crucial task for organizations aiming to retain customers and maintain steady revenue growth. With increasing competition across industries such as telecommunications, banking, and subscription-based services, predicting customer attrition has become an important application of machine learning. This study proposes a data-driven approach to identify customers who are likely to discontinue services based on historical customer data.

The methodology includes data preprocessing, feature selection, and the implementation of supervised learning algorithms such as Logistic Regression, Decision Trees, Random Forest, and Gradient Boosting. Model performance is evaluated using metrics including accuracy, precision, recall, F1-score, and AUC-ROC. Experimental results indicate that ensemble methods provide superior predictive performance compared to individual classifiers. Key factors influencing churn include contract type, tenure, service usage patterns, and billing information.

The proposed model demonstrates how machine learning techniques can effectively support proactive customer retention strategies, enabling organizations to reduce churn rates and enhance customer lifetime value.

Paper ID: ICA6NT 419

IOT Enabled Wearable Things Finder Using Wi-Fi RSSI Node Scanning And Cloud-Based Localization

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ABSTRACT

The paper presents an intelligent indoor object tracking system designed to locate misplaced items efficiently in indoor environments. The proposed system utilizes wireless signal strength-based localization combined with cloud-enabled data processing to determine the approximate location of tagged objects. By employing multiple wireless scanning nodes placed in different rooms, the system continuously monitors the received signal strength from a tag attached to the object. The collected signal strength data is transmitted to a cloud platform where the signals are analyzed to identify the most probable location of the object. The processed location information is then delivered to a wearable device that alerts the user through a display and indicator mechanism. This architecture integrates wireless sensing, cloud communication, and wearable user interaction to provide a practical and scalable indoor tracking solution. The system is implemented using embedded microcontroller modules and cloud messaging protocols, and its performance is evaluated in real indoor environments. Experimental results demonstrate that the proposed system is capable of accurately identifying the room-level location of objects within a short response time while maintaining low cost and simple infrastructure requirements.

Paper ID: ICA6NT 420

AI INTEGRATED VIRTUAL WARDROBE STYLIST USING VISION-BASED BODY ANALYSIS

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ABSTRACT

This research introduces an AI-Integrated Virtual Wardrobe Stylist that combines computer vision-based body analysis with an intelligent styling recommendation engine to deliver personalized fashion suggestions. By extracting features like body shape, facial structure, and skin tone through landmark detection and mapping them to wardrobe metadata using a weighted scoring model, the system goes beyond visualization to provide automated, intelligent, and interactive outfit generation.

Paper ID: ICA6NT 423

Automatic Water Tank Cleaner With Monitoring System

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ABSTRACT

A whole system that can clean water tanks on its own and keep an eye on parameters like turbidity, temperature, pH, microbiological content, and smell of the water. To guarantee clean and safe water storage, the apparatus makes use of integrated sensors, water jets, and mechanical brushes.

The Design apparatus ensures safe and hygienic water storage through the use of mechanical brushes, water jets, and integrated sensors.

Paper ID: ICA6NT 425

DEEP LEARNING FOR INTELLIGENT BONE FRACTURE DIAGNOSIS

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ABSTRACT

Deep learning technology provides an efficient and automated approach for analyzing medical images without heavy reliance on manual interpretation. Its key advantages, including hierarchical feature extraction, high classification accuracy, and adaptability across datasets, make it highly suitable for bone fracture detection from radiographic images. Existing fracture detection systems commonly utilize Convolutional Neural Networks (CNNs) with transfer learning to classify X-ray images. Although these approaches achieve promising results, they often face challenges such as limited annotated datasets, poor generalization across anatomical regions, difficulty in detecting multiple fractures within a single image, and lack of interpretability.

To address these limitations, this paper proposes an advanced deep learning framework that integrates self-supervised pretraining, feature fusion, and attention mechanisms to enhance classification performance and generalization capability. Object detection models such as YOLO and R-CNN are incorporated to accurately localize multiple fractures, while Grad-CAM and SHAP techniques improve model interpretability and clinical transparency. The proposed system enhances diagnostic accuracy, robustness, and reliability, providing an effective and trustworthy solution for automated bone fracture detection in medical imaging applications.

Paper ID: ICA6NT 428

HARDWARE-BASED DEVICE AUTHENTICATION WITH DYNAMIC GATEWAY TRUST AND REAL-TIME ATTACK PREVENTION

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ABSTRACT

Wireless Sensor Networks are widely deployed in Internet of Things applications such as environmental monitoring, healthcare systems, smart cities, and industrial automation. Despite their importance, sensor nodes operate with limited power, memory, and computational capability, making them highly vulnerable to security threats including replay attacks, node cloning, impersonation, and unauthorized access. Traditional cryptographic key based authentication mechanisms increase energy consumption and are susceptible to key extraction when nodes are physically captured, reducing overall network reliability and security.

To address these challenges, the proposed system introduces a hardware-based authentication framework using SRAM Physical Unclonable Functions available within standard microcontrollers. The intrinsic startup behaviour of Static Random Access Memory generates unique, device specific fingerprints without requiring additional hardware components. Fuzzy extraction techniques are applied to correct noise and environmental variations in PUF responses, while cryptographic hashing ensures secure and stable identity generation. This approach provides lightweight, energy efficient, and tamper resistant authentication suitable for resource constrained wireless sensor nodes.

Beyond device authentication, the framework incorporates a dynamic trust evaluation mechanism implemented at the gateway. The gateway continuously monitors node behaviour, authentication outcomes, packet transmission frequency, and communication patterns to compute real time trust scores. Based on these scores, trust -based access control decisions are enforced to allow or restrict network participation. Malicious or compromised nodes are detected and isolated promptly, preventing unauthorized data transmission. By combining hardware rooted identity with behavioural trust analysis, the system significantly enhances network security, scalability, and long-term operational stability.

Paper ID: ICA6NT 430

AI DRIVEN INTERVIEW PREPARATION PLATFORM WITH PERSONALIZED SKILLS

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ABSTRACT

An AI-driven interview preparation platform with personalized skills was developed to assist job seekers in preparing for technical and HR interviews using artificial intelligence services. The platform integrates the Gemini AI API to analyze user resumes, skills, and job preferences and generate personalized interview questions, skill evaluations, and improvement suggestions. The system provides features such as ATS resume scoring, role-based interview question generation, mock interview assistance, and performance feedback. Based on the user's current skill level, the platform highlights strengths, identifies skill gaps, and recommends areas for further improvement. All AI-based analyses and recommendations were obtained through real-time interactions with the Gemini API without implementing custom machine learning or NLP models. This platform aims to simplify interview preparation by offering an intelligent, personalized, and user-friendly solution that aligns with current recruitment processes, thereby improving candidate confidence and their readiness for interviews.

Paper ID: ICA6NT 432

E-BachatGat using Flutter and Firebase

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ABSTRACT

Bachat Gats help people in India save money and take loans, especially in rural areas. Most Bachat Gats still use notebooks and manual calculations, which often cause mistakes and confusion.

E-BachatGat –is a mobile application developed to manage Bachat Gats digitally. The app uses Flutter and Firebase and follows a role-based system for Adhyaksh, Up-Adhyaksh, Sachiv, and Members. All financial calculations such as savings, loan EMI, interest, and remaining loan are done automatically.

The app supports Marathi, English, and Hindi and provides features like reports, notifications, and PDF downloads. E-BachatGat makes Bachat Gat management easier, more accurate, and more transparent.

Paper ID: ICA6NT 433

TOURVISTA: AN INTELLIGENT TOUR RECOMMENDATION PLATFORM

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ABSTRACT

The travel and tourism industry has experienced rapid digital transformation in recent years. However, travelers still face challenges in accurately estimating travel expenses and efficiently booking services. This paper presents an AI-powered travel cost estimation and booking system that integrates machine learning algorithms, real-time data analysis, and user preferences to provide personalized and accurate travel planning solutions. The proposed system predicts total travel costs, recommends optimal travel options, and automates booking processes. Experimental results demonstrate improved cost accuracy, enhanced user experience, and reduced planning time compared to traditional systems.

Paper ID: ICA6NT 435

DIGITAL MENTAL HEALTH AND PSYCHOLOGICAL SUPPORT SYSTEM FOR STUDENTS

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ABSTRACT

Mental health problems such as stress, anxiety, depression, and emotional imbalance are becoming increasingly common among students due to academic pressure, competition, and personal challenges. Despite the rising need for psychological support, many students hesitate to seek professional help because of social stigma, lack of awareness, limited counseling facilities, and concerns about privacy. This research presents a Digital Mental Health and Psychological Support System for Students, a web-based platform designed to provide accessible, confidential, and continuous mental health assistance. The system enables students to securely register and assess their mental well-being, interact with an intelligent chatbot for emotional support, and receive personalized recommendations for stress management and self-care. Developed using modern web technologies, the platform ensures user privacy while promoting early detection and intervention of mental health issues. The proposed system aims to enhance emotional well-being, encourage self-awareness, and reduce stigma associated with mental health support, offering a cost-effective and scalable solution for educational institutions.

The proposed system is a web-based platform that provides secure user authentication, self-assessment tools, and an interactive chatbot to offer immediate emotional assistance and coping strategies. The platform enables students to evaluate their mental well-being, receive personalized recommendations, and access mental health resources in a confidential environment. By integrating technology with psychological support mechanisms, the system aims to promote early detection of mental health issues, increase awareness, and reduce the stigma associated with seeking help.

Paper ID: ICA6NT 436

SMART AWARENESS SYSTEM FOR AADHAAR SEEDING AND DBT-ENABLED ACCOUNTS USING AI/ML

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ABSTRACT

The Direct Benefit Transfer (DBT) system is used by the Government of India to transfer scholarship amounts directly to students' bank accounts. To receive these benefits, students must have a DBT-enabled Aadhaar-seeded bank account. However, many students are not aware of the difference between an Aadhaar-linked bank account and a DBT-enabled Aadhaar-seeded account. This lack of awareness results in scholarship delays and rejections.

This paper proposes a smart awareness system to educate students about Aadhaar seeding and DBT enablement. The developed system provides clear information, step-by-step guidance, and awareness modules to help students understand the correct process required for successful scholarship disbursement. By using digital technology, the system aims to reduce errors in Aadhaar seeding and ensure timely delivery of Pre-Matric and Post-Matric scholarships.

Paper ID: ICA6NT 437

TRANSLITERATION TOOL FOR STREET SIGNS USING AI

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ABSTRACT

Street signs play a crucial role in navigation, transportation safety, and tourism. However, in multilingual regions, street signs are often written in local scripts that may not be easily readable by visitors or non-native speakers. This paper proposes an AI-based transliteration tool designed to automatically detect, recognize, and transliterate street sign text from one script to another in real time. The system integrates Optical Character Recognition (OCR) with deep learning-based transliteration models to ensure high accuracy across diverse languages and environmental conditions. Experimental results demonstrate that the proposed system achieves robust performance under varying lighting, angles, and font styles, making it suitable for deployment in smart city and assistive navigation applications

SPEAKONE AI UNIFIED MULTILINGUAL CHAT ENGINE

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ABSTRACT

In higher education institutions, administrative offices receive a large number of repetitive queries from students related to admissions, fees, scholarships, examinations, placements, and campus facilities. These queries are often raised in different regional languages, creating communication barriers and increasing workload for staff. To address this challenge, this research proposes the design and development of an AI-powered multilingual chatbot system that provides accurate and real-time responses to student queries in multiple languages such as English, Hindi, Marathi, and other regional languages.

The proposed system uses Natural Language Processing (NLP) and Artificial Intelligence techniques for intent recognition, language detection, and context-aware conversation. The chatbot is capable of understanding student questions in their preferred language and delivering responses in the same language, thereby improving accessibility and inclusivity. It also includes features such as knowledge base management, conversation logging, analytics, and fallback mechanisms for unanswered queries. The system is designed to be scalable, secure, and easy to maintain by non-technical users such as student volunteers.

The implementation demonstrates how multilingual conversational systems can improve efficiency, reduce administrative workload, and enhance student experience by providing 24/7 support. This solution contributes to the advancement of smart education by enabling equitable access to institutional information and promoting digital transformation in academic environments.

Paper ID: ICA6NT 440

OFFLINE MULTIMODAL SEARCH PLATFORM USING AI/ML

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ABSTRACT

The rapid growth of unstructured data such as documents, images, and audio recordings has created challenges in information retrieval and intelligent data analysis. Traditional search systems operate only on text-based inputs and lack cross-modal understanding. This paper proposes an Offline Multimodal Retrieval-Augmented Generation (RAG) System that integrates document processing, image understanding, and audio transcription within a unified semantic retrieval framework. The system operates entirely offline using FAISS vector database and a locally deployed Large Language Model (LLM) through llama.cpp. Additionally, a secure role-based authentication mechanism using Flask and SQLite ensures controlled access to the system. The proposed solution enables users to retrieve context-aware answers from diverse data formats with citation transparency. Experimental evaluation demonstrates improved retrieval accuracy, secure access control, and complete offline functionality, making the system suitable for privacy-sensitive environments.

Paper ID: ICA6NT 441

METROMIND-AI-BASED DOCUMENT VERIFICATION SYSTEM

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ABSTRACT

Modern metro rail organizations generate and receive thousands of documents daily including engineering drawings, maintenance reports, safety circulars, vendor invoices, regulatory notices, HR policies, and board communications. Manual verification and review of such documents lead to information delays, compliance risks, and operational inefficiencies. MetroMind is an AI-based Document Verification System developed to automate document ingestion, classification, verification, summarization, and action extraction. The system uses FastAPI (Python), MySQL database, FAISS vector search, OCR for multilingual documents (English and Malayalam), and LLM-based AI models for intelligent processing. MetroMind ensures traceable AI outputs linked to document ID and page number, supports role-based access control, and enhances compliance monitoring. The system reduces manual workload, improves decision-making speed, and strengthens regulatory adherence in metro rail environments.

AI STARTUP IDEA VALIDATOR

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ABSTRACT

Startup ecosystems are highly competitive and uncertain environments where early-stage ideas often fail due to lack of structured validation. This paper presents an Artificial Intelligence-based Startup Idea Validator that leverages Large Language Models (LLMs) to evaluate the feasibility and potential of startup concepts. The system collects structured inputs such as problem statement, target market, value proposition, and business model, and analyzes them using advanced LLM-based reasoning and contextual understanding. Instead of relying solely on traditional NLP feature extraction techniques, the proposed system uses prompt-engineered LLM API integration to generate structured business insights, including market potential analysis, risk assessment, scalability evaluation, and improvement recommendations. Experimental testing demonstrates improved idea clarity, structured feedback generation, and enhanced decision support compared to informal or intuition-based validation methods.

DYNAMIC SPEED GOVERNANCE SYSTEM USING ML AND GPS INTEGRATION

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ABSTRACT

Rapid advancements in intelligent vehicle control, energy-efficient propulsion, and autonomous mobility have accelerated the development of predictive speed regulation systems. This work presents the development and simulation of a Machine Learning (ML) and GPS-based dynamic speed governance system integrated with a fuel cell powered rover platform. The system utilizes GPS data and geo-fencing techniques to identify speed-restricted zones and environmental boundaries. A machine learning model predicts optimal speed references based on real-time positional data and sensor feedback, enabling anticipatory speed adjustments instead of reactive braking. The predicted speed is implemented through a Field-Oriented Control (FOC) motor drive, ensuring accurate torque and speed regulation for PMSM, BLDC, or induction motors. A Proton Exchange Membrane (PEM) fuel cell serves as the primary energy source, providing stable and efficient power. The proposed architecture demonstrates an intelligent, scalable, and energy-efficient framework for next-generation vehicle speed governance systems.

Paper ID: ICA6NT 444

DIGITAL FORENSICS FRAMEWORKS AND LEGAL COMPLIANCE IN CYBERCRIME INVESTIGATION

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ABSTRACT

The exponential growth of digital technologies has both facilitated and complicated the investigation of cybercrimes. Digital forensics, therefore, plays a pivotal role in navigating the intersection of technology and law. This paper delves into the nuances of legal standards and practices within cybercrime investigations. It highlights the necessity for rigorous adherence to legal procedures in the digital evidence gathering, the challenges posed by the sophistication of cybercrime, and the ethical considerations that arise in the pursuit of justice. Through a detailed analysis of digital forensics reports, this study reveals prevalent issues at various levels of cybercrime investigation and the need for harmonized legal frameworks to ensure effective and just prosecution of cybercrimes.

TRANSIT PULSE HUB USING AI/ML

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ABSTRACT

The rapid growth of urbanization and smart city initiatives has increased the demand for intelligent transportation management systems. Traditional transit monitoring systems often lack real-time adaptability, predictive capabilities, and data-driven optimization, leading to congestion, delays, and inefficient resource utilization. This paper presents Transit Pulse Hub using Artificial Intelligence and Machine Learning, an intelligent transportation monitoring and management platform designed to optimize transit operations and enhance commuter experience.

The proposed system leverages machine learning algorithms, real-time data analytics, and natural language processing to analyze traffic patterns, predict congestion, optimize route planning, and provide instant updates to users. It integrates GPS tracking, and AI-based predictive models to monitor vehicle movement and passenger flow dynamically. Additionally, a smart chatbot interface assists commuters with route suggestions, delay notifications, and schedule inquiries.

Paper ID: ICA6NT 447

AI-DRIVEN CONTENT SCHEDULING USING TRAFFIC FORECAST MODELS

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ABSTRACT

To address node congestion and service degradation resulting from abrupt traffic surges in Content Delivery Networks (CDNs), as well as the inefficiencies associated with manual scheduling, an intelligent traffic scheduling approach driven by traffic forecasting was developed. Initially, the characteristics of traffic data were examined to determine appropriate time-series behavior, and model parameters were derived by analyzing temporal and seasonal patterns. Using historical traffic records, a Seasonal ARIMA-based forecasting model was designed to predict future traffic loads. The predicted traffic information was then utilized to proactively generate scheduling strategies, enabling timely traffic redistribution during peak conditions. Experimental evaluation demonstrated that the deviation between forecasted and actual traffic remained within 5%, satisfying accuracy requirements. By executing scheduling actions prior to node overload, the approach effectively maintained service quality and user experience.

AI-BASED DETECTION OF MALICIOUS ACTIVITIES IN QR CODE INFRASTRUCTURE

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ABSTRACT

This paper focuses on enhancing QR Code security by identifying and mitigating malicious QR-based attacks, as QR Codes are widely used in digital payments, authentication systems, and information access. We present a comprehensive infrastructure that captures and analyzes encoded QR content to detect potential security threats embedded within URLs and payloads. By continuously extracting lexical and structural features from scanned QR data, the system performs dynamic analysis to classify codes as benign or malicious in real time. The proposed framework leverages modern computational techniques such as Artificial Intelligence and Machine Learning models including Random Forest, LightGBM, XGBoost, and Neural Networks to understand complex attack patterns. In addition to threat detection, the system integrates encryption mechanisms and third-party threat intelligence services to improve validation accuracy and reliability. This approach enables accurate, real time malicious QR detection while providing a secure and scalable infrastructure for protecting users against QR-based cyber threats.

AI-DRIVEN IMAGING SYSTEM FOR REAL-TIME MICROPLASTIC DETECTION IN AQUATIC ENVIRONMENTS

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ABSTRACT

To address the increasing microplastic pollution in aquatic environments and the limitations of slow laboratory-based detection methods, an AI-driven imaging system was developed for real-time microplastic identification. Water sample images were first enhanced using preprocessing techniques such as noise reduction, contrast enhancement, and sharpening to improve visibility in turbid conditions. A YOLO-based deep learning model was then trained using prepared datasets to detect and classify microplastic particles such as fibers, fragments, films, and pellets. The trained model was integrated into a Django-based web application, allowing users to upload sample images and instantly obtain results including bounding boxes, confidence scores, and particle counts. Experimental results show that the system provides fast and reliable detection even for low-quality images. Overall, the proposed approach reduces manual effort and offers a cost-effective solution for continuous microplastic monitoring.

PREDICTING PROJECT COST AND TIMELINE USING AI/ML

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ABSTRACT

Power transmission projects are large-scale infrastructure projects that play a vital role in national development. such projects often face challenges related to cost overruns and delays due to multiple factors such as terrain conditions, weather, regulatory approvals, vendor performance, material availability, and manpower constraints. Traditional project management approaches mainly rely on manual estimation and experience-based planning, which may not effectively capture complex relationships among these factors. this research presents a machine learning based prediction system to forecast project cost and timeline overruns in power transmission projects. The proposed system uses historical project data and key influencing factors to identify potential risks and delay-prone areas. The results indicate that the ml-based approach can support better project planning, early risk identification, and improved decision-making. The system is scalable and can be applied to large infrastructure projects to enhance timely and cost-effective project execution.

AI-Powered Multilingual Content Localization Engine for Skill Courses

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ABSTRACT

India's vocational education ecosystem serves learners from diverse linguistic and cultural backgrounds. However, a significant portion of training materials is available only in English or limited regional languages, creating barriers for rural and non-English-speaking learners. Manual translation of educational content is time-consuming, costly, and often inconsistent in quality. This research proposes an AI-Powered Multilingual Content Localization Engine designed to automatically translate and culturally adapt vocational training materials into multiple Indian languages.

The proposed system uses Natural Language Processing (NLP), Machine Learning, Speech-to-Text, and Text-to-Speech technologies to localize text, audio, video, and assessment content while maintaining contextual and domain-specific accuracy. Additionally, domain vocabulary banks and feedback-driven AI learning mechanisms improve translation quality over time. The system integrates with Learning Management Systems (LMS) and national skill development platforms to enable scalable content distribution. The proposed solution aims to enhance accessibility, inclusivity, and effectiveness in India's skill development ecosystem.

Keywords: Artificial Intelligence, Multilingual Translation, Skill Development, NLP, Localization Engine, Indian Languages

AI-Based Farmer Query Support and Advisory System

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ABSTRACT

Agriculture plays a crucial role in the Indian economy, yet farmers frequently face challenges in obtaining timely, accurate, and accessible agricultural advisory services due to limited availability of experts, geographical constraints, and language barriers. To address these issues, this research proposes an AI-Based Farmer Query Support and Advisory System that delivers instant and personalized agricultural guidance through multimodal interaction, including text, voice, and image inputs in farmers' native languages. The system enables farmers to easily communicate their problems and receive relevant recommendations without the need for physical visits to agricultural extension centers.

The proposed system integrates advanced technologies such as Natural Language Processing, crop disease detection using image analysis, and a knowledge-based recommendation engine to generate context-aware advisory related to pests, fertilizers, weather conditions, and crop management practices. By supporting multilingual and multimodal interaction, the system enhances accessibility for farmers with diverse literacy levels. Acting as a digital agricultural assistant, the solution improves farm decision-making, reduces crop losses, and promotes sustainable agricultural practices across varied farming regions.

Keywords: Artificial Intelligence, Agriculture Advisory, Crop Disease Detection, Natural Language Processing, Farmer Support System

Paper ID: ICA6NT 456

GREENCYCLE: FROM WASTE TO WORTH USING AI

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ABSTRACT

Urban waste management is a critical challenge in modern cities due to inefficient collection and lack of segregation. Traditional systems often rely on hardware sensors which are expensive and hard to maintain. This paper proposes "GreenCycle", a software-driven solution that leverages Artificial Intelligence and SQLite for localized waste management. The system uses image classification to identify waste types and automates task assignment for workers. By using a local SQLite database, the system ensures data privacy and offline functionality, effectively converting 'Waste to Worth' through a reward-based system.

SEGMENTATION OF IMAGES THROUGH FRACTIONAL ORDER PARTICLE SWARM OPTIMIZATION TECHNIQUES

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ABSTRACT

Image segmentation is a fundamental step in computer vision, enabling accurate interpretation of visual information across applications such as medical diagnosis, remote sensing, and object recognition. Conventional segmentation methods and classical Particle Swarm Optimization (PSO) often struggle with noise sensitivity, poor boundary preservation, and premature convergence. To address these challenges, this paper presents an enhanced segmentation framework based on Fractional-Order Particle Swarm Optimization (FOPSO). By incorporating fractional calculus into the swarm's velocity update process, the proposed algorithm introduces long-term memory effects that improve global search capability, convergence stability, and robustness to local minima. The FOPSO-based segmentation model is applied for multi-threshold selection and clustering-based pixel classification in MATLAB. Experimental evaluations on natural, medical, and satellite images demonstrate that FOPSO achieves superior performance compared to classical PSO, Otsu thresholding, and K-means clustering, with significant improvements in PSNR, SSIM, Dice score, and segmentation accuracy. The results indicate that fractional-order swarm intelligence provides a powerful optimization strategy for high-precision and noise-resilient image segmentation.

AI DRIVEN MENTAL HEALTH CHATBOT FOR PERSONALIZED THERAPY SUPPORT USING MACHINE LEARNING, NLP AND EMOTIONAL INTELLIGENCE FRAMEWORK

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ABSTRACT

Older adults often face significant challenges in accessing timely mental health and healthcare support due to physical limitations, social isolation, and difficulties in using modern digital technologies. Traditional healthcare systems are not always capable of providing continuous emotional and medical assistance. this paper proposes an AI-based intelligent chatbot designed of deliver personalized mental health and healthcare support for older adults. the system integrates natural language processing (NLP), sentiment analysis, machine learning, and voice-enabled interfaces to provide empathetic conversations, medication reminders, health information, and emergency safety escalation. the chatbot continuously learns user behavior and preferences to offer adaptive and context-aware responses. experimental evaluation shows that the proposed system improves accessibility, emotional well-being, and user satisfaction while reducing technological barriers for elderly users.

The solution demonstrates a scalable and effective approach to enhancing digital healthcare services for older adults. The proposed approach emphasizes low computational complexity and ease of deployment, making it suitable for real-world environments such as homes, assisted living facilities, and community healthcare centers. By combining emotional intelligence with practical healthcare support, the system contributes toward building a more inclusive and human-centered digital healthcare ecosystem.

Papered:ICA6NT 461

SMART ADARSH GRAM MAPPER USING AI/ML

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ABSTRACT

Rural development assessment in India traditionally relies on manual verification and fragmented evaluation mechanisms. This study proposes a Smart Adarsh Gram Mapper, a data-driven analytical framework designed to evaluate village development status using demographic and infrastructure indicators. The system computes a composite Development Score derived from weighted parameters such as education, healthcare facilities, sanitation, electricity access, and basic amenities. A rule-based decision mechanism determines eligibility for the Adarsh Gram Puraskar based on predefined thresholds. The framework is implemented using Python Flask, government census datasets in CSV format, and structured scoring logic. The proposed model enhances transparency, minimizes subjectivity, and supports evidence-based rural governance.

KHELSAARTHI USING AI, FLUTTER AND FIREBASE

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ABSTRACT

KhelSaarthi is an AI-powered sports assessment and training mobile application designed to enhance athletes' performance through intelligent analysis and real-time feedback. The system integrates Artificial Intelligence, camera-based motion detection, and Firebase cloud services to evaluate user performance in various sports-related activities. It enables automated fitness assessment tests, records user performance data, and provides personalized improvement suggestions. The application leverages machine learning techniques to analyze movement patterns and generate performance scores. KhelSaarthi ensures secure authentication and data storage using Firebase integration. The platform is developed using Flutter for cross platform compatibility and seamless user experience. By combining AI-driven insights with mobile technology, the system aims to bridge the gap between traditional coaching and digital sports analytics. The proposed solution enhances accessibility, accuracy, and scalability in sports training environments. This research highlights the architectural design, implementation methodology, and performance evaluation of the KhelSaarthi system.

Paper ID: ICA6NT 463

SMART EDU HUB USING FLUTTER AND FIREBASE

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ABSTRACT

The growing need for organized and accessible student data in educational institutions highlights the limitations of traditional record-keeping systems, which are often fragmented and manually maintained. These conventional methods make it difficult to track student achievements, verify records, and generate consolidated reports efficiently. This project proposes a Smart Student Hub, a centralized digital platform designed to manage and validate students' academic and co-curricular activities. The system enables students to upload their achievements, which are then verified by faculty members to ensure authenticity. It also provides real-time dashboards, automated portfolio generation, and analytical reporting to support institutional requirements such as accreditation processes like NAAC. The platform is developed using modern technologies, ensuring secure data handling, scalability, and real-time access.

Paper ID: ICA6NT 465

AI-Powered Navigation Aid for the Blind

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ABSTRACT

Visually impaired individuals face major challenges in independent navigation due to unknown objects, hazardous distances, and crowded spaces. This paper presents a mobile app that auto-starts the camera on launch for real-time object detection with distance measurement, danger alerts, time-date info, GPS navigation, and face recognition. Using YOLOv8 and MediaPipe AI models, it achieves 95% accuracy, 1-10m distance detection, and 30 FPS voice alerts. Tests with 25 participants showed 48% fewer collisions, 32% faster navigation, and 91% recognition accuracy ($p < 0.01$). This affordable, hardware-free solution outperforms commercial apps for inclusive smart cities.

Keywords: AI Navigation Aid, Visually Impaired Assistance, Object Detection, YOLOv8, Face Recognition, Distance Measurement, GPS Navigation, Voice Alerts

AI-POWERED PERSONALIZED LEARNING PATH GENERATOR USING AI/ML

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ABSTRACT

AI-Powered Personalized Learning Path Generator is a web-based intelligent system that generates customized learning paths using Artificial Intelligence and Machine Learning techniques. The system analyzes learner profile details such as education, existing skills, work experience, career aspirations, and learning pace to perform skill gap analysis and generate structured learning pathways. The generated paths are aligned with the National Skills Qualifications Framework (NSQF) levels and follow competency-based education principles guided by the National Council for Vocational Education and Training (NCVET). The system supports three types of users: Learners, Trainers, and Policymakers. Learners receive adaptive course and career recommendations, trainers monitor progress and guide students, and policymakers analyze aggregated skill data for workforce planning and decision-making.

Paper ID: ICA6NT 467

Uber Rides Prediction Using Machine Learning

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ABSTRACT

Accurately predicting ride demand is critical to improving Uber performance and increasing customer satisfaction. This paper investigates machine learning methods to predict Uber ride requests by analysing historical data including time, location, and other factors such as weather. After preprocessing and feature engineering, various models (linear regression, decision trees, random forests, and GBR) are evaluated for their prediction performance. GBR emerged as the best model, achieving over 99% accuracy due to its ability to handle complex data and capture nonlinear relationships.

This study highlights the importance of physical and environmental features in improving prediction accuracy, allowing Uber to allocate drivers more efficiently and reduce passenger waiting times. These findings provide insight into demand forecasting, improved management, and service quality of ride heling platforms. Uber, ride demand forecasting, machine learning, forecasting, GBR, time series, previous data, infrastructure, distribution, impact of weather forecasting

ANDROID-BASED DIGITAL MARKETPLACE APPLICATION FOR EMPOWERING SELF-HELP GROUP (SHG) MEMBERS

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ABSTRACT

The empowerment of Self-Help Groups (SHGs) through digital platforms has become essential for promoting women entrepreneurship and rural economic development. Traditional SHG product distribution faces challenges including limited market reach, manual inventory management, and language barriers. This paper presents a comprehensive mobile e-commerce application designed specifically for SHG operations, integrating Firebase for real-time data management, Cloudinary for media storage, and multi-language support (English, Marathi, Hindi) to enhance accessibility. The system implements role-based access control, automated order management, and analytics dashboard for business insights. Experimental results demonstrate improved operational efficiency with 60% reduction in order processing time and enhanced user engagement through localized content delivery. The solution is scalable, cost-effective, and adaptable for rural entrepreneurship ecosystems.

DEVELOPMENT OF AN AUTOMATED PUBLIC RESTROOM SANITATION CONTROL ARCHITECTURE USING MICROCONTROLLER TECHNOLOGY

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ABSTRACT

Smart sanitation infrastructure is a research project with technological orientation that aims at enhancing hygiene assurance, operational stability, and protection of human health in the conditions of shared restrooms. The inefficient maintenance programs within the urban, semi-urban, and rural sanitation systems promote the growth of microbes and spread of diseases, and the systematic sanitation control has not yet been fully addressed in the literature. The proposed research design proposes an inbuilt sanitation oversight design incorporating water-level control, automated waste, touchless sanitizer dispensing, occupancy identification, user registration, and smoke warning. An embedded controller with a compact commercial-grade implementation coordinated on the ATmega365 platform triggers occupancy enumeration in response to restroom entry, and on reaching an intended threshold of ten users, an alert communication is triggered together with a programmed chemical-assisted flush sequence, then a two-cycle water flush is activated. The waste-bin lids are controlled by ultrasonic proximity sensing based on the interpretation of reflected acoustic signals, and thus, a contactless way of disposing of waste is made possible. A distance-triggered dispensing system is used to activate a servo-controlled sanitizer spray when the hand proximity sensor signalling pathways are overcome. The presence of a full-time water level surveillance will initiate an automated pumping module when the overhead storage capacity reduces to less than functional needs. The experimental validation was found to be functionally steady under real-time conditions. The suggested sanitation management framework attained 96.8 percent total

operational accuracy and the adopted output deployment model attained 95.9 percent accuracy of the sensing, control, and actuation processes. The research framework developed helps to facilitate the modernization of sanitation on a large scale, streamlining the resources, and ensuring compliance with hygiene in smart ecosystems of public infrastructure.

WASTE MATERIALS CLASSIFICATION USING MACHINE LEARNING TECHNIQUES

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ABSTRACT

Effective waste management plays a significant role in environmental sustainability and resource conservation. Traditional waste classification methods are often prone to errors, leading to improper sorting and reduced recycling efficiency. To address this issue, a Convolutional Neural Network (CNN)-based model is proposed for automated waste material classification.

The model is developed using a structured dataset and is designed to categorize environmental surface materials into predefined classes: Background, Brick, Concrete, Ground, and Wood. By leveraging deep learning techniques, the system automatically extracts spatial and texture-based features from input images to perform accurate classification.

The model is trained and evaluated to measure its performance using standard accuracy metrics. The proposed approach achieved an overall accuracy of 89.88%, demonstrating its effectiveness in improving classification performance. The integration of AI-based waste classification systems can significantly reduce human error, enhance sorting efficiency, and support sustainable and intelligent waste management practices.

Paper ID: ICA6NT 471

PREDICTIVE MODELLING OF GENETIC DISORDERS USING MACHINE LEARNING

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ABSTRACT

Detecting and understanding gene patterns before the onset of genetic diseases holds immense promise for prevention. This paper discusses the current state of machine learning techniques available for the disease diagnosis problem, focusing on existing approaches, their analysis, and possible future work. Machine learning algorithms can process large amounts of genetic information such as DNA sequences, gene expression data, and images to identify and recognize patterns that could be useful in predicting disease risk or its progression. In this regard, the paper also focuses on a sequence comparison method using protein-level similarity, leveraging codon-based translation from DNA to protein sequences to calculate similarity indices between a test sequence and multiple disease-related sequences. This shows how machine learning and bioinformatics can bring remarkable progress in predictive analytics.

A RANDOM FOREST-DRIVEN DECISION SUPPORT SYSTEM FOR CROP FORECASTING AND FERTILIZER OPTIMIZATION IN SUSTAINABLE AGRICULTURE

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ABSTRACT

With the recent advancements in machine learning and data analysis, it has become possible to develop systems that can predict the type of crops to be grown and also the amount and type of fertilizer to be used. this project applies machine learning to analyze different factors that affect the successful growing of crops, like nitrogen (n), phosphorus (p), potassium (k), ph, soil moisture content, temperature, humidity, and intelligent system that will provide recommendations on the best crop(s) to be grown in a region and, accordingly, will recommend the best fertilizer(s) for increasing the productivity of the crop(s). The aim of this research is to develop an intelligent system that will help farmers identify their best crop(s) by analyzing the health of the soil and environment to help them maximize the productivity of their farms. In addition to helping farmers determine what crop(s) are most appropriate for their growing conditions, this intelligent system will also provide recommendations on how to enhance soil and environmental conditions through the appropriate use of fertilizers as a means of achieving healthy soil and increasing yield.

REAL-TIME ONLINE NEWS ARTICLE CLASSIFICATION USING MACHINE LEARNING AND NLP TECHNIQUES

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ABSTRACT

The rapid expansion of digital journalism has resulted in a massive influx of news articles generated across online platforms every second. Efficient categorization of such content is essential for improving information retrieval, personalized recommendation systems, and automated content moderation. Manual classification is impractical due to the scale and speed of content generation, thereby necessitating intelligent automated solutions.

This research proposes a real-time news headline classification system using machine learning (ml) and natural language processing (NLP) techniques. The study utilizes a dataset containing 45,500 news records categorized into ten domains including business, politics, sports, entertainment, travel, wellness, world news, parenting, style & beauty, and food & drink. text preprocessing techniques such as tokenization, stop-word removal, lemmatization, and TF-IDF feature extraction are applied prior to model training. Two supervised learning algorithms – naïve bayes and logistic regression – are implemented and comparatively evaluated using performance metrics such as accuracy, precision, recall, and f1-score.

Experimental findings reveal that logistic regression achieves superior classification performance compared to naïve bayes in real-time prediction scenarios. The proposed framework demonstrates robustness, scalability, and applicability in live news aggregation systems.

Paper ID: ICA6NT 475

ROBUST TRANSMISSION NOISY ERROR RESILIENT IMAGE CODING FOR MULTIMEDIA COMMUNICATION SYSTEMS

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ABSTRACT

In modern multimedia communication systems, the reliable transmission of images over noisy communication channels is a major challenge. Noise, interference, and data loss during transmission can lead to image degradation, affecting the quality of visual information. This project focuses on the development of a **robust and error-resilient image coding system** using **Digital Image Processing (DIP) techniques implemented in MATLAB**. The proposed system uses image compression, channel coding, and error-correction techniques to improve transmission reliability. Techniques such as **Discrete Cosine Transform (DCT)** and **wavelet-based compression** are applied to reduce bandwidth requirements, while **error control coding methods** like Reed–Solomon and convolutional codes are used to detect and correct transmission errors. Noise models such as **Gaussian noise** and **salt-and-pepper noise** are simulated to evaluate system robustness. The system performance is analyzed using objective quality metrics such as **PSNR (Peak Signal-to-Noise Ratio)** and **SSIM (Structural Similarity Index)**. Experimental results show that the proposed model significantly improves image quality and transmission reliability under noisy channel conditions. This project demonstrates an efficient and practical approach for achieving robust image transmission in multimedia communication systems.

ENHANCING CROSS-DOMAIN FACE ANTI-SPOOFING THROUGH TEMPORAL MODELING

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ABSTRACT

Face presentation attack detection remains vulnerable to domain shifts in camera, environment, and attack medium, despite the recent advances in deep learning-based face anti-spoofing. To address this, we propose a self-supervised temporal test-time adaptation framework for RGB-based face anti-spoofing that explicitly exploits long-range temporal dynamics and unlabeled target videos. The architecture fuses an appearance stream of RGB images and a geometry stream such as facial landmarks within a temporal transformer, and is trained with supervised live/spoof classification and sequence-level self-supervised objectives, including temporal consistency and geometric motion prediction. At deployment, only a small subset of temporal parameters is updated by minimizing these temporal self-supervised losses on unlabeled target clips. Extensive cross-dataset experiments show that the proposed framework improves generalization over strong spatial, spatio-temporal, domain generalization, and test-time adaptation baselines, particularly in challenging train-test configurations with large domain gaps, and complements existing Test-Time Adaptation approaches for face anti-spoofing that primarily rely on spatial or style statistics. These results demonstrate that temporal self-supervision and lightweight test-time adaptation form an effective and practical solution for robust, RGB-only face anti-spoofing in unseen domains.

CORNER PERTURBATION- ENABLED DUAL - RESONANT CIRCULARLY POLARIZED ANTENNA FOR RESILIENT UAV NETWORKS

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ABSTRACT

This paper presents the design and simulation of a compact dual-band microstrip patch antenna for resilient unmanned aerial vehicle (UAV) communication networks operating at 2.4 GHz and 5.2 GHz Wi-Fi bands. Dual-band operation provides spectrum flexibility and communication redundancy, which are essential for maintaining reliable links in dynamic UAV environments such as swarm coordination, surveillance, and emergency response. Circular polarization (CP) is targeted to reduce polarization mismatch and enhance link stability during arbitrary UAV orientation, which requires excitation of two orthogonal modes with equal amplitude and a 90° phase difference. The proposed antenna employs a U-slot to generate dual-resonant behaviour, strategically placed stubs for impedance tuning and current balancing, corner perturbation to split degenerate modes and introduce quadrature phase shift, and a defected ground structure (DGS) to improve bandwidth and impedance characteristics. Designed on an FR4 substrate with compact dimensions of $48 \times 39 \times 1.6 \text{ mm}^3$, the antenna achieves simulated peak gains of 3.29 dBi at 2.4 GHz and 2.54 dBi at 5.2 GHz, making it suitable for short- to medium-range, low-altitude UAV platforms such as quadcopters and micro-UAVs. Although satisfactory impedance matching is achieved, the axial ratio does not consistently remain below 3 dB across both bands, indicating that further optimization is required to fully realize dual-band circular polarization for highly resilient UAV network deployment.

Paper ID: ICA6NT 480

SMART SURVEILLANCE & IDENTIFICATION SYSTEM USING AI

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ABSTRACT

This paper proposes an intelligent Smart Surveillance & Identification System that leverages Artificial Intelligence for real-time monitoring and automated recognition of individuals. The system combines computer vision and deep learning techniques to detect faces and identify persons from live video feeds. Facial feature extraction along with match-based verification ensures accurate identification while minimizing human involvement. In comparison to conventional surveillance systems, the proposed solution improves detection accuracy, reduces manual effort, and provides instant alerts upon successful identification. Experimental results indicate that the system performs reliably under normal conditions, and its scalable design makes it suitable for applications such as public safety monitoring, missing person tracking, and security management in institutions.

HYBRID MACHINE LEARNING FRAMEWORK FOR ACCURATE HEART DISEASE PREDICATION

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ABSTRACT

Heart disease remains one of the leading causes of mortality worldwide. Accurate and reliable prediction of heart disease using machine learning techniques can significantly assist medical professionals in early diagnosis and treatment planning. However, traditional classification algorithms often suffer from overfitting, high false prediction rates, limited generalization capability, and dependency on complete feature sets without proper optimization. Several existing approaches utilize classifiers such as Support Vector Machine (SVM), Artificial Neural Network (ANN), Hidden Markov Model (HMM), and Decision Tree techniques combined with feature selection methods like Correlation-Based Feature Selection (CFS) and Gain Ratio. Although these models achieve moderate performance, they often lack robustness under varying dataset characteristics and may generate inconsistent predictions. This study proposes an Improved Random Forest (IRF) model for heart disease prediction using optimized feature selection, hyperparameter tuning, and ensemble learning optimization. The proposed approach enhances prediction reliability by improving feature representation, reducing variance through controlled tree depth, and minimizing false positive predictions. The model is evaluated using 10-fold cross-validation and assessed using multiple performance metrics including Accuracy, Precision, Recall, F1-score, and ROC-AUC. A comparative evaluation against baseline models such as SVM, ANN, and Decision Tree demonstrates superior performance of the Improved Random Forest model. Experimental results show significant improvement in prediction stability and classification accuracy, confirming the robustness, reliability, and clinical applicability of the proposed system.

Paper ID: ICA6NT 483

SECURE AND TRANSPARENT VEHICLE PROCUREMENT SYSTEM BASED ON BLOCKCHAIN

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ABSTRACT

Blockchain technology has become more widespread in our lives revolutionizing various industries through improved security, transparency, and operational efficiency. Its decentralized ledger system is particularly effective in areas like finance and supply chain management ensuring data integrity and reducing the need for middlemen. This study explores how blockchain technology is used in the process of buying vehicles highlighting its benefits compared to methods. Traditional vehicle purchases involve a network of dealers, banks and regulators leading to inefficiencies, higher costs and potential fraud. The usual process involves steps like financing checking vehicle history and changing ownership. Each requiring extensive paperwork and thirdparty intervention. In contrast using blockchain for vehicle purchases can simplify things through contracts that automate tasks like verifying history securely transferring ownership instantly settling payments. The unchangeable nature of records ensures that all transaction data remains secure against tampering fostering trust between buyers and sellers. Furthermore, blockchain can cut costs significantly by removing the need for middlemen such, as escrow services and title companies while reducing burdens. The advanced security elements built into technology help reduce the chances of fraudulent actions like altering odometer readings or selling stolen cars. This study showcases a comparison illustrating how blockchain can simplify the process of buying vehicles offering an economical and secure experience.

Paper ID: ICA6NT 484

AI-BASED FRAMEWORK FOR PERSONALIZED IDP

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ABSTRACT

The increasing need for effective succession planning and leadership development in large organizations has created demand for intelligent and data-driven systems. Traditional methods of preparing Individual Development Plans (IDPs) often lack personalization, real-time analysis, and precise competency mapping, leading to generic development strategies and inefficient talent growth. This paper presents an Intelligent Recommendation System for Personalized Individual Development Plans (IDPs), designed to analyze employee profiles and align them with target role requirements.

The proposed system leverages machine learning algorithms, data analytics, and competency gap analysis techniques to evaluate performance ratings, experience history, and assessment scores. It identifies specific functional, behavioral, and leadership competency gaps and generates prioritized development recommendations. The system integrates AI-based predictive models and a dynamic dashboard to monitor employee progress and support decision-making by the succession planning committee. Additionally, it recommends job rotations, internal training modules, mentorship programs, and leadership development initiatives to enhance future leadership readiness.

Paper ID: ICA6NT 485

DESIGN AND IMPLEMENTATION OF A LOW-COST IOT-BASED MILK QUALITY MONITORING SYSTEM USING ESP32

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ABSTRACT

Milk quality monitoring is essential to ensure consumer safety and prevent economic loss in dairy supply chains. Conventional laboratory-based testing methods are costly and time-consuming. this paper presents the design and implementation of a low-cost IOT-based milk quality monitoring system using ESP32. The proposed system measures key quality parameters such as PH, temperature, and turbidity to evaluate milk freshness. the acquired data is processed in real time and displayed locally using an LCD module. Additionally, WIFI capability enables remote monitoring through cloud-based platforms. The developed prototype demonstrates a cost-effective and portable solution suitable for small-scale dairy applications. URE, and turbidity to evaluate milk freshness. the acquired data is processed in real time and displayed locally using an LCD module. Additionally, WIFI capability enables remote monitoring through cloud-based platforms. The developed prototype demonstrates a cost-effective and portable solution suitable for small-scale dairy applications.

Paper ID: ICA6NT 487

REMOTE CLASSROOM FOR RURAL COLLEGES USING FLUTTER AND FIREBASE

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ABSTRACT

Rural diploma colleges in India often face a shortage of expert lecturers in advanced technological fields such as Artificial Intelligence, VLSI, and renewable energy, which creates a significant learning gap between rural and urban students. Although online education platforms exist, their effectiveness in rural areas is limited due to low bandwidth, unstable internet connectivity, and lack of advanced digital infrastructure. This research proposes a low-bandwidth virtual classroom ecosystem specifically designed for rural institutions, focusing on optimized audio transmission, compressed visual content, and lightweight recorded sessions for asynchronous learning. The system supports interactive features such as quizzes and discussions that function efficiently under low data conditions, while ensuring compatibility with entry-level smartphones and minimal technical complexity. Experimental evaluation indicates a substantial reduction in data consumption with reliable learning performance, making the proposed solution cost-effective, accessible, and suitable for bridging the digital divide in rural technical education.

Smart Classroom & Timetable Scheduler using AI

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ABSTRACT

The increasing demand for efficient classroom management has created the need for intelligent automation systems. Traditional timetable scheduling methods rely on manual planning, which often leads to scheduling conflicts, poor resource utilization, and time-consuming processes.

This paper proposes a **Smart Classroom & Timetable Scheduler using AI/ML** that automatically generates optimized timetables, assigns classrooms, manages faculty schedules, and prevents conflicts using machine learning techniques. The system includes real-time updates and predictive analytics to improve efficiency. Results show reduced conflicts, better resource utilization, and improved scheduling accuracy. The solution is scalable and suitable for schools, colleges, and universities.

Keywords: Smart Classroom, Timetable Scheduling, Machine Learning, AI Automation, Conflict Detection, Resource Allocation, Predictive Analytics, Academic Management.

Paper ID: ICA6NT 490

AI-Based Cattle and Buffalo Classification Using ML

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ABSTRACT

AI-Based Cattle and Buffalo Classification Using ML using Artificial Intelligence (AI) and Machine Learning (ML) is an advanced system designed to automatically identify and classify livestock species from images. The main objective of this project is to accurately distinguish between cattle and buffaloes using computer vision and deep learning techniques. The system uses image processing and convolutional neural networks (CNN) to extract important visual features such as body shape, horn structure, skin texture, and colour patterns. A trained machine learning model analyses these features and predicts the animal type with high accuracy. The model is trained on a labelled dataset containing multiple images of cattle and buffaloes under different lighting and environmental conditions to improve performance and reliability.

Keywords:Artificial Intelligence (AI), Machine Learning (ML), Image Processing, Animal Classification, Cattle Identification, Buffalo Identification, Deep Learning, Convolutional Neural Network (CNN), Computer Vision, Smart Farming, Livestock Management.

ANALYSIS AND PREDICTION OF CRYPTOCURRENCY PRICES USING MACHINE LEARNING

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ABSTRACT

Cryptocurrencies have emerged as a significant component of the global financial ecosystem due to their decentralized nature and high investment potential. However, the highly volatile and nonlinear behavior of cryptocurrency markets makes accurate price prediction a challenging task. This work proposes a hybrid machine learning framework that combines random forest regression and long short-term memory (LSTM) networks to predict bitcoin prices more effectively.

The proposed system integrates historical market data, technical indicators, and on-chain features to improve prediction accuracy. Change point detection is incorporated to handle sudden market fluctuations. Experimental evaluation demonstrates that the hybrid approach provides better generalization and robustness compared to single-model methods. The system can assist investors and traders in making informed decisions in dynamic cryptocurrency markets.

ENHANCED DENTAL LESION CLASSIFICATION USING DEEP LEARNING ARCHITECTURES AND DIGITAL IMAGE PROCESSING

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ABSTRACT

Artificial Intelligence (AI) has significantly transformed medical image analysis by enabling automated and accurate diagnostic support systems. Deep Learning, a prominent branch of AI, facilitates hierarchical feature extraction from large-scale datasets, improving pattern recognition capabilities. In pediatric dentistry, automated detection of dental caries from intraoral scan images plays a crucial role in early diagnosis and preventive treatment planning. Existing caries detection approaches commonly utilize Attention U-Net architectures trained on ICCMS-annotated intraoral scan datasets. These models are optimized using AdamW optimization, class weighted focal loss, and data augmentation techniques to manage class imbalance. Although these methods achieve high performance in identifying severe lesions, their detection accuracy decreases for early and moderate-stage caries due to imbalanced datasets and limited diagnostic feature representation.

To overcome these challenges, the implemented system incorporated DenseNet and Efficient-based architectures to enhance feature reuse and classification efficiency. The developed model improved the detection of early and moderate lesions while effectively handling class imbalance and extracting richer diagnostic cues. Experimental results demonstrated enhanced robustness and predictive accuracy of the AI-driven dental caries classification model, making it suitable for reliable clinical support applications.

BLOCKCHAIN-INTEGRATED DECENTRALIZED AI ARCHITECTURE FOR HIGH-ACCURACY BLOOD GLUCOSE PREDICTION

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ABSTRACT

The proposed work suggests a secure and smart predictions system of the glucose level based on the adoption of advanced Machine Learning (ML) that takes into consideration the three main issues associated with healthcare diagnostics: predictive precision, clinical interpretability, and security of health data. The system incorporates multi-source information, such as PIMA In-dian Diabetes dataset, Continuous Glucose Monitoring (CGM) data and wearable sensor-derived physiological parameters and stored securely in Google Drive or in GDPR compliant cloud-based accounts. Data completeness is guaranteed by missing value deletion, outliers dislodging through the Interquartile Range (IQR), data-norm, categorical encoding, and class-weighting using Borderline-SMOTE to achieve statistical robustness as well as clinical stability. In feature engineering, manually derived clinical indicators (e.g., Glucose-Body Mass Index (BMI) ratio, Age-Family History index) are joined with latent representations of data constructed through deep autoencoder. A total of 15 high-impact predictors is identified by means of feature selection based on Support Vector Machine Recursive Feature Elimination (SVM-RFE). Tuned Extreme Gradient Boosting (XGBoost) grids searches-based model reports better compared to benchmark techniques like LSTM or Federated Learning comprising 96.07% accuracy, ROC-AUC score of 0.992, sensitivity of 0.97, and specificity of 0.96. Shapley Additive explanations (SHAP) demonstrate that clinically relevant patterns occur: a higher risk of diabetes by 48 percent in case of glucose level over 140

mg/dL and reduced risk by 32% in those with BMI under 25 weights. The proposed framework allows integrating a Solidity-based Ethereum blockchain with the SHA-256 meta-hashing, AES-256 encryption, and Smart contract-based access control allowing tamper-proof, auditable, and privacy-protected diagnostics. Within ethical and legal frameworks, the offered solution has high predictive performance and allows it to present a scalable and trustworthy method to next generation intelligent glucose monitoring system for smart healthcare.

AROGYASATHI APP USING FLUTTER AND FIREBASE

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ABSTRACT

Efficient management of child and maternal healthcare data is critical for strengthening grassroots public health systems in India. Anganwadi centers, operating under the integrated child development services (ICDS) framework, are responsible for maintaining records related to nutrition, immunization, and early childhood development. However, dependence on paper-based registers limits operational efficiency and increases the possibility of data inconsistency and reporting delays. This research proposes Arogyasathi, a cross-platform mobile application developed using flutter and integrated with firebase cloud services to digitize Anganwadi health management processes. The system enables structured child registration, automated vaccination scheduling, real-time growth tracking, secure cloud storage, and role-based access control. The proposed digital model enhances transparency, reduces administrative burden, and supports data-driven monitoring of child health indicators.

Predictive Analysis of Smartphone Addiction Using Machine Learning

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ABSTRACT

Smartphone addiction has become a growing concern in recent years, with increasing numbers of people exhibiting symptoms such as excessive phone use, loss of productivity, and even physical and psychological health problems. As a result, there is a need to develop effective tools for predicting smartphone addiction and identifying those at risk. In this study, we built an ML model to predict smartphone addiction using survey data that included demographics, phone usage habits, and psychological factors such as stress, anxiety, and depression. The data was preprocessed by encoding categorical variables and normalizing numerical variables to improve learning efficiency.

The model was trained and evaluated using standard performance metrics and achieved high accuracy in predicting smartphone addiction. Key influencing factors included phone usage patterns, age, gender, and stress levels. This model can assist healthcare professionals in identifying at-risk individuals and help app developers design less addictive applications. Further research is needed to validate the findings using larger and more diverse datasets.

EMBEDDED AI SYSTEM FOR MONITORING AND PREDICTING FAULTS IN ELECTRONIC HARDWARE (MOTHERBOARD)

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ABSTRACT

Modern electronic systems require continuous monitoring to ensure reliability and prevent unexpected hardware failures. Traditional monitoring techniques often rely on manual inspection or simple threshold-based alerts, which may fail to detect early-stage faults. This project presents an Embedded AI System for Monitoring and Predicting Faults in Electronic Hardware that integrates embedded hardware sensing with machine learning-based fault prediction.

The proposed system collects real-time electrical parameters such as current, voltage, and speed using sensor modules connected to an ESP32 microcontroller. The collected data is transmitted to a processing unit where machine learning algorithms analyze the operational behavior of the hardware system. An Isolation Forest algorithm is used for anomaly detection, while a K-Nearest Neighbor (KNN) classifier is used for fault classification. A web-based dashboard provides real-time monitoring, fault diagnosis, and system analytics for better visualization and control. The system can detect abnormal conditions and provide early warnings, allowing preventive maintenance before critical failure occurs. Experimental results demonstrate that the proposed approach improves fault detection accuracy and provides efficient real-time monitoring for electronic hardware systems.

INTELLIGENT CODE REVIEW SYSTEMS: A SURVEY OF STATIC, MACHINE LEARNING, AND TRANSFORMER- BASED APPROACHES

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ABSTRACT

The rapid evolution of software systems has intensified the demand for efficient, scalable, and reliable code review mechanisms. Traditional manual code inspection, while effective in capturing high-level design flaws and contextual reasoning, suffers from subjectivity, scalability limitations, and time inefficiency. Over the past decade, automated code analysis has transitioned from rule-based static analysis relying on ABSTRACT Syntax Trees (ASTs) to advanced machine learning and transformer-based models capable of understanding both syntactic and semantic patterns in source code. This survey systematically examines the progression of code analysis techniques, including static rule-based tools, machine learning-driven defect detection, large language models such as CodeBERT and GraphCodeBERT, and hybrid multimodal systems that integrate structural and natural language artifacts. The paper compares these approaches across dimensions such as accuracy, efficiency, scalability, explainability, and integration into modern development pipelines. Furthermore, it highlights current challenges including cross-language generalization, computational overhead, model transparency, and human-in-the-loop validation. By synthesizing recent literature and industrial practices, this survey provides a comprehensive understanding of intelligent code review systems and outlines future research directions toward trustworthy, developer-centric, and scalable AI-assisted software quality assurance frameworks.

Paper ID: ICA6NT 503

Digital Health Record Management System For Migrant Workers Using Python & MySQL

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ABSTRACT

Migrant workers frequently encounter interruptions in healthcare services due to geographic mobility and the absence of systematically maintained medical documentation. Paper-based records are vulnerable to loss, damage, and fragmentation, which negatively impacts treatment continuity and clinical decision-making. This study presents the design and implementation of a Digital Health Record Management System (DHRMS) tailored specifically for migrant worker populations.

The proposed system employs a web-based architecture developed using Python and MySQL to enable secure storage, retrieval, and management of patient medical data. It integrates authentication mechanisms, role-based authorization, and encrypted data handling to ensure confidentiality and integrity of sensitive health information.

Experimental evaluation in a simulated healthcare environment demonstrates improved record retrieval efficiency, reduced duplication of diagnostic procedures, and enhanced care coordination. The system offers a scalable and cost-effective solution suitable for semi-urban and rural healthcare settings.

Keywords: Digital Health Records, Migrant Healthcare, Electronic Health Records, Health Information Systems, Secure Database Management, Role-Based Access Control

Paper ID: ICA6NT 504

A NOVEL AI-BASED APPROACH FOR CRYPTOCURRENCY PRICE FORECASTING

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ABSTRACT

Cryptocurrency has emerged as a popular digital financial asset, attracting significant attention from investors and researchers due to its high volatility and rapid price fluctuations. Predicting cryptocurrency prices is a complex task because it depends on multiple factors such as historical trends, market behaviour, and public sentiment. This work presents a predictive framework for forecasting the future prices of Bitcoin using advanced machine learning and deep learning approaches.

The proposed system employs Long Short-Term Memory (LSTM) networks as the primary model to capture long-term dependencies in time-series financial data. In addition, other models such as Gated Recurrent Unit (GRU) and XGBoost are implemented to enhance prediction performance and conduct comparative analysis. GRU is utilized for its computational efficiency and faster convergence, while XGBoost is applied to identify nonlinear patterns and structured relationships in the data. The models are trained using historical cryptocurrency datasets including price, trading volume, and technical indicators. Furthermore, the system integrates sentiment analysis from social media platforms and financial news sources to improve prediction accuracy by capturing investor behaviour and market emotions.

The performance of each model is evaluated using standard metrics such as RMSE, MAE, MAPE, R^2 , and F1 Score. The developed web-based application enables users to visualize historical price movements, predicted values, and future price trends. Experimental results demonstrate that the proposed multimodal LSTM model achieves 99.36% prediction accuracy (R^2), which is significantly better than most traditional models.

SMART HELPDESK TICKETING SOLUTION FOR IT SERVICES USING AI/ML

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ABSTRACT

The growing demand for faster and more reliable it support has highlighted the limitations of traditional helpdesk systems, which depend heavily on manual ticket categorization and assignment. This research presents an ai-powered helpdesk solution that applies machine learning and natural language processing to automate ticket classification, prioritization, and technician assignment. The system integrates a chatbot for real-time assistance, predictive analytics for proactive issue handling, and automated workflows to streamline operations. Experimental evaluation shows that the proposed model improves classification accuracy, reduces resolution time, and enhances user satisfaction compared to conventional approaches. The solution is scalable, adaptable, and well-suited for modern it service environments.

Paper ID: ICA6NT 506

SMART REAL-TIME DISASTER RESPONSE TRAINING SYSTEM POWERED BY AI & ML

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ABSTRACT

This project integrates Artificial Intelligence (AI) and Machine Learning (ML) technologies to create dynamic disaster scenarios such as floods, earthquakes, fires, and other emergencies. The system uses historical disaster data and real-time inputs to simulate realistic environments where trainees can practice decision-making and response strategies in a safe and controlled setting. AI-driven decision support provides guidance during simulations, while ML algorithms analyze user actions, adapt scenarios based on performance, and deliver instant feedback for continuous improvement.

EDGE COMPATIBLE DEEP LEARNING FRAMEWORK FOR PLANT LEAF DISEASE DETECTION

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ABSTRACT

This study introduces a lightweight deep learning model that detects plant leaf disease under edge computing. The traditional deep learning has demonstrated nice results in disease classification but was computationally very costly, making it inefficient to low-end devices. The traditional convolutional neural network to classify plant leaf images based on multiple classes using the standard convolutional neural network is used as the baseline of this study. Though the proposed approach has demonstrated acceptable performance, it has been constrained by the time taken in the training and non-adaptability to resource-constrained platforms. The proposed study will seek to address these obstacles by creating an effective and portentous disease detection system. The system proposed is based on transfer learning with the lightweight deep learning models that detect informative visual cues in the images of plant leaves. To focus on disease-specific characteristics and deemphasize background data a preprocessing component with an organized strategy of image scaling, normalization and edge-enhancement is employed. The trained fine-tuned classification model on the processed images is then trained so as to be able to differentiate between healthy and malfunctioning leaf of plant varieties of various crops. The experiment results indicate that the proposed method of transfer learning produced an improved classification performance with a significant decrease in computing complexity over the conventional convolutional neural network model. The framework is lightweight, which allows it to run on low-resourced devices to aid offline and near real-time disease detection. The system developed offers a practical means of solving precision agriculture in the real world through early detection of diseases as well as promoting timely management of crops.

Paper ID: ICA6NT 508

EHR COMPANION FOR ASHA WORKERS USING PYTHON & MYSQL

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ABSTRACT

Rural healthcare systems often struggle with effective patient data management, monitoring, and reporting due to limited digital infrastructure and heavy reliance on manual record-keeping. ASHA workers, who serve as the primary link between communities and healthcare services, frequently maintain paper-based records, which can result in data loss, inaccuracies, and delays in information sharing. To address these challenges, this project presents a web-based Electronic Health Record (EHR) system specifically designed to support ASHA workers in managing healthcare data efficiently. The system allows digital registration of patients, recording of daily visits, and secure storage of medical reports. Developed using the Python Flask framework with a MySQL database, the platform ensures structured data storage, role-based user access, and centralized supervision.

INTELLIGENT MATERIAL DEMAND PREDICTION USING MACHINE LEARNING

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ABSTRACT

Accurate material demand forecasting is essential for maintaining balanced inventory and uninterrupted supply chain operations. Traditional estimation methods often rely on manual calculations, which may lead to stock shortages or excess inventory. This research presents an Intelligent Material Demand Prediction System that utilizes machine learning to analyze historical consumption data and recognize demand patterns.

The proposed system generates future demand forecasts along with automated reorder recommendations and stock alerts. By using data-driven predictions, organizations can improve procurement planning, reduce wastage, and enhance operational efficiency. The model demonstrates improved forecasting accuracy compared to conventional approaches and can be applied across sectors such as healthcare, retail, construction, and public supply systems.

Paper ID: ICA6NT 510

AI-BASED STUDENT DROPOUT RISK & INTERVENTION SYSTEM USING PYTHON AND MYSQL

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ABSTRACT

Student dropout remains a critical issue for educational institutions, affecting both student success and institutional performance. This research presents an AI-powered Student Dropout Prediction System aimed at identifying students at risk of leaving their studies at an early stage. The system analyzes multiple factors, including attendance, academic performance, study hours, stress levels, and behavioral trends, to calculate a risk score for each student. Based on this score, students are classified into low, medium, or high-risk categories. The system is implemented as a web-based platform, allowing students, educators, and administrators to monitor progress and take timely action. By enabling early detection of at-risk students, this approach facilitates proactive interventions, supports personalized academic assistance, and contributes to higher retention rates and improved overall academic outcomes.

HEART PLAQUE DETECTION SYSTEM

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ABSTRACT

It is widely accepted that predicting cardiovascular disease is important because it helps doctors make better medical decisions. Early detection allows patients to make necessary lifestyle changes and receive proper medical treatment at the right time. Since early intervention improves health outcomes, machine learning (ML) has become a useful tool for predicting and understanding heart disease symptoms.

In this study, we focused on diagnosing heart plaque disease using two machine learning algorithms: Naïve Bayes and Least Squares Support Vector Machine (LSSVM). The main objective of this research is to apply the Naïve Bayes algorithm for heart plaque diagnosis and compare its performance with the LSSVM algorithm. The dataset used in this study was taken from Kaggle and consists of clinical data related to heart plaque disease.

The results show that the LSSVM algorithm achieved an accuracy of 67.3%, while the Naïve Bayes algorithm achieved a higher accuracy of 78%. Based on these findings, the Naïve Bayes algorithm performed better than the LSSVM algorithm in detecting heart plaque disease in this dataset.

AI-ENABLED CYBER INCIDENT AND SAFETY WEB PORTAL FOR DEFENCE USING AI/ML

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ABSTRACT

With the rapid advancement of digital technologies, defense personnel, veterans, and their families are increasingly becoming prime targets of cyber threats such as phishing, malware attacks, identity theft, honey-trapping, and social engineering, while traditional complaint mechanisms remain manual, slow, and incapable of intelligent threat assessment. To address these challenges, this paper proposes an AI enabled cyber incident & safety web portal exclusively designed for defense communities, which leverages machine learning and natural language processing (NLP) techniques to automatically classify cyber complaints, generate threat risk scores (0–100), prioritize incidents based on severity, and provide real-time alerts. the portal incorporates a secure reporting system, chatbot-based assistance, an analytics dashboard, and role-based access control to ensure data security and operational efficiency. Experimental evaluation indicates significant improvement in response time, accurate threat classification, and enhanced cybersecurity awareness across the defense ecosystem.

AI-BASED INTERNSHIP MATCHMAKING SYSTEM UNDER PM INTERNSHIP SCHEME

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ABSTRACT

The PM internship scheme aims to provide structured industry exposure to students across the country. However, manually matching thousands of applicants with suitable internship opportunities is time-consuming and often inefficient. This project proposes an ai-based internship matchmaking system that automates the process using machine learning algorithms. The system matches candidates with internships based on skills, qualifications, location preferences, sector interests, and affirmative action policies. it ensures fair representation from rural and aspirational districts while optimizing industry capacity. the proposed solution includes a functional ai engine and a prototype front-end interface demonstrating intelligent placement recommendations.

Paper ID: ICA6NT 514

Analysis and Prediction of Crypto currency Prices using Machine Learning

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ABSTRACT

Cryptocurrencies have emerged as a significant component of the global financial ecosystem due to their decentralized nature and high investment potential. However, the highly volatile and nonlinear behavior of cryptocurrency markets makes accurate price prediction a challenging task. This work proposes a hybrid machine learning framework that combines Random Forest Regression and Long Short-Term Memory (LSTM) networks to predict Bitcoin prices more effectively.

The proposed system integrates historical market data, technical indicators, and on-chain features to improve prediction accuracy. Change point detection is incorporated to handle sudden market fluctuations. Experimental evaluation demonstrates that the hybrid approach provides better generalization and robustness compared to single-model methods. The system can assist investors and traders in making informed decisions in dynamic cryptocurrency markets.

Keywords: Cryptocurrency, Bitcoin, Price Prediction, Machine Learning, LSTM, Random Forest, Hybrid Model

Paper ID:ICA6NT 516

EVALUATING BERT, MISTRAL-7B, AND FLAN-T5 ACROSS LANGUAGE UNDERSTANDING AND GENERATION TASKS

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ABSTRACT

Transformer-based language models now play a central role in modern NLP systems, driving progress across both understanding and generation tasks, enabling significant advancements in both Natural Language Understanding (NLU) and Natural Language Generation (NLG). Despite their widespread adoption, selecting an appropriate model for a specific application remains non-trivial due to variations in architectural design, computational demands, and task-oriented optimization.

This paper presents an implementation-driven comparative study of three widely used transformer-based models: BERT, Mistral-7B, and FLAN-T5. These models represent distinct design philosophies, including encoder-only architectures optimized for semantic understanding, decoder-only architectures designed for efficient text generation, and encoder-decoder architectures enhanced through instruction tuning to support multi-task learning. The models are implemented using publicly available pre-trained checkpoints and evaluated under consistent experimental settings across representative NLP tasks such as text classification, extractive question answering, summarization, and open-ended text generation.

The experimental results demonstrate that BERT delivers strong performance on understanding-centric tasks with relatively low computational overhead, making it well

suited for classification and information extraction scenarios. Mistral-7B excels in generative tasks, producing fluent and coherent outputs with efficient inference behavior. FLAN-T5 exhibits robust instruction-following capability and balanced performance across both NLU and NLG tasks, highlighting its flexibility in multi-task environments. Overall, the findings emphasize the importance of aligning model selection with task requirements, resource constraints, and deployment objectives, offering practical insights for the effective use of transformer-based models in real-world NLP applications.

Paper ID: ICA6NT 518

MEALSMART USING FLUTTER AND FIREBASE

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ABSTRACT

MealSmart is a mobile-based application developed using Flutter and Firebase to automate and modernize meal and mess management operations in hostels and institutions. Traditional meal management systems rely on manual record-keeping for customer registration, attendance tracking, and payment management, which often results in data inaccuracies, lack of transparency, and increased administrative workload.

The primary objective of MealSmart is to provide a secure, efficient, and cloud-based digital platform that simplifies attendance monitoring and monthly payment tracking through real-time database integration. The system consists of two main modules: Admin Module and Customer Module. The Admin Module enables administrators to manage customer records, update attendance details, monitor payments, and maintain overall system control. The Customer Module allows users to securely log in, view attendance records, and track payment status in real time.

Firebase Authentication ensures secure user access, while Cloud Firestore provides a scalable and real-time database for storing and synchronizing data. By integrating mobile and cloud technologies, MealSmart reduces manual errors, enhances transparency, improves operational efficiency, and provides a reliable digital solution for modern meal management systems.

Paper ID: ICA6NT 519

SMART SUPPLY CHAIN FOR FARMERS USING AI/ML DEMAND FORECASTING AND MARKET ROUTE OPTIMIZATION

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ABSTRACT

Agriculture supply chains often suffer from demand uncertainty, price fluctuations, and inefficient logistics. This research proposes a Smart Supply Chain System for farmers that uses Artificial Intelligence and Machine Learning for demand forecasting and optimal market route selection. The system analyzes historical crop data, weather patterns, and market prices to predict demand and suggest the best transportation routes. The proposed solution helps farmers reduce losses, increase profit margins, and make data-driven decisions.

Paper ID:ICA6NT 520

MEDIKEY: AN IOT-BASED DIGITAL HEALTH CARDPLATFORM USING RFID,FINGERPRINT BIOMETRICS, AND CLOUD INTEGRATION FOR REAL-TIME PATIENT RECORD MANAGEMENT

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ABSTRACT

This paper presents MediKey, an IoT-based digital health card platform that integrates RFID identification, fingerprint biometric authentication, and cloud-based data management to modernize hospital record-keeping. Traditional paper-based medical records suffer from issues of inaccessibility, duplication, and data loss. MediKey addresses these challenges by assigning each patient a unique RFID card linked to a centralized Firebase cloud database. The system employs an ESP32 microcontroller for hardware interfacing, a Python Flask backend for server-side logic, and a responsive web dashboard for real-time data visualization. The platform supports three user roles: patient, doctor, and administrator, each with specific access permissions. This paper outlines the system architecture, hardware components, data flow, database structure, security mechanisms, and performance results, demonstrating that the platform achieves real-time, secure, and scalable health record management.

Paper ID:ICA6NT 521

ERP-BASED INTEGRATED STUDENT MANAGEMENT SYSTEM USING PYTHON AND MYSQL

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ABSTRACT

The **ERP-Based Integrated Student Management System using Python and MySQL** is a web-based application designed to automate and manage academic and administrative activities of educational institutions. The system integrates modules such as student registration, faculty management, attendance tracking, fee management, and report generation into a single centralized platform. Developed using Python for backend processing and MySQL for database management, the system ensures secure data storage, fast retrieval, and role-based access control. It reduces manual paperwork, minimizes errors, improves efficiency, and enhances communication between administrators, faculty, and students. Overall, the system provides a reliable and scalable solution for effective institutional management.

Paper ID:ICA6NT 523

AI-POWERED MULTIMODEL HEALTHCARE ASSISTANT FOR DIAGNOSING AND MONITORING

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ABSTARCT

The integration of artificial intelligence in healthcare has significantly improved the quality of clinical decision support, enabling faster diagnosis and more efficient patient care management. This work proposes a healthcare assistant utilizing AI technologies to integrate multiple specialized clinical models into a single platform, benefiting both patients and physicians.

The platform provides diagnostic models for detecting diseases from X-ray images, CT scans, and MRI images to facilitate early detection and treatment of illnesses. The system also offers a medical chatbot that enables patients to access information on diseases, symptoms, drugs, and medical treatments. Furthermore, it includes an AI-based prescription generator to simplify medical documentation for physicians. All these models operate under a unified user interface, allowing healthcare providers to access patient information, diagnostic results, and AI-generated insights on a single screen.

The platform also promotes trust and transparency in the medical field by incorporating techniques such as EfficientNet-B0 (Deep Convolutional Neural Network), transfer learning, and the AdamW optimizer to generate explainable outcomes for users. Another module includes a REM classification system, which analyzes EEG data to classify sleep stages such as REM and non-REM, contributing to AI-driven healthcare decision support.

Paper ID:ICA6NT 524

AI-DRIVEN PANCHAKARMA PATIENT MANAGEMENT AND INTELLIGENT THERAPY SCHEDULING SYSTEM

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ABSTRACT

Panchakarma therapies are widely used in Ayurvedic healthcare for detoxification, rejuvenation, and treatment of chronic diseases. However, many Panchakarma centers still rely on manual methods for managing patient records, therapy schedules, and treatment documentation. This often leads to inefficiencies, scheduling conflicts, and difficulty in monitoring patient progress. This paper proposes AyurSutra, a Panchakarma Patient Management and Therapy Scheduling Software designed to digitize and automate clinical operations in Ayurvedic centers. The system provides features such as patient registration, automated therapy scheduling, real-time treatment tracking, and notification systems for pre- and post-procedure precautions. By integrating modern web technologies and data management techniques, the proposed system improves operational efficiency, enhances patient care, and reduces administrative workload. The platform aims to provide a scalable and user-friendly solution for modern Panchakarma clinics and hospitals..

DESIGN AND IMPLEMENTATION OF AN IoT-BASED HVDC POWER MONITORING AND PROTECTION SYSTEM

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ABSTRACT

Electrical power transmission has traditionally been based on alternating current (AC) systems because they are easy to generate, transform, and distribute. AC technology has supported power networks for many decades and remains widely used today. However, as power demand increases and transmission distances become longer, certain limitations of traditional AC systems become more noticeable. These include higher transmission losses, reactive power issues, reduced efficiency in underground and submarine cables, and challenges in maintaining system stability over long distances.

This project proposes a high-voltage DC (HVDC) power feeding prototype integrated with an IoT-based monitoring and protection system. A +5V power supply energizes the Arduino Uno (ATmega328P) and all connected sensors. The DHT11 sensor measures temperature and humidity, the voltage sensor monitors the input or load voltage, and the current sensor measures the current flowing through the circuit. The gas sensor detects the presence of harmful gases in the environment. All these sensor signals are sent to the Arduino Uno, where the microcontroller processes and analyzes the data continuously.

The ESP32 controller is used for wireless communication, enabling the system to transmit monitored data to a remote device or cloud platform for real-time monitoring. Based on predefined threshold values programmed in the Arduino, if any parameter such as overvoltage, overcurrent, abnormal temperature, or gas leakage is detected, the Arduino sends a control signal to the relay driver. The relay driver then activates or deactivates the relay to control the connected load, ensuring system protection and safe operation.

Paper ID:ICA6NT 527

VISION BASED PEOPLE COUNTING SYSTEM FOR INDOOR AND OUTDOOR ENVIRONMENTS USING DIFFERENT DEEP LEARNING MODELS

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ABSTRACT

In modern applications, detecting, tracking, and counting people have become essential tasks in the field of Computer Vision. One of the main challenges in people counting systems is occlusion, where individuals are partially or completely hidden, which often leads to incorrect counting in crowded scenes. This study evaluates several deep learning-based object detection models, including Single Shot Detector (SSD), Faster R-CNN, and different versions of YOLO such as YOLOv3, YOLOv4, YOLOv5, YOLOv8, and the more advanced YOLOv9. These models were tested in crowded and challenging environments to evaluate their effectiveness in people counting tasks. The results show that YOLOv9 outperforms the other models, providing higher detection accuracy and better handling of occlusion. It also achieves improved precision, recall, and F1-score, making it a more reliable model for accurate people counting in complex and crowded environments.

Paper ID: ICA6NT 528

MACHINE LEARNING FOR SAFETY AND SUSTAINABILITY IN RAILWAY AND POWERLINE SYSTEMS

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ABSTRACT

The need to provide sufficient and secure power and railway infrastructure to meet future demand prompts the continuing need for upgraded designs to improve safety standards, current load predictability, and signal optimization. This work describes a powerline and railway integrated machine learning (ML) system for tackling these fundamental issues.

Utilizing powerful predictive analytics and advanced ML algorithms, the framework continuously monitors power lines and railway tracks, and forecasts varying loads while maintaining a check on system failures. This enables improved signal arrangement and effective supervision of traffic. The system incorporates safety diagnostics to detect faults such as overloading, power supply fluctuations, and potential derailment scenarios, allowing necessary precautions to be taken within the shortest possible time.

Load forecasting is carried out using time series analysis and neural networks to distribute energy efficiently and reduce wastage. Furthermore, the framework enhances railway signaling to minimize delays, coordinate train schedules, and improve passenger experience using reinforcement learning.

This integrated solution has strong societal relevance as it addresses modern challenges in energy sustainability, safety, and infrastructure efficiency. By reducing accidents, minimizing energy losses, and improving railway operations, the framework promotes environmental conservation, cost reduction, and increased public confidence.

Paper ID:ICA6NT 529

SMART CROP PREDICTION SYSTEM USING MACHINE LEARNING TECHNIQUES

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ABSTRACT

Agriculture plays a vital role in the Indian economy and supports a large portion of the population. However, farmers often face difficulties in selecting suitable crops due to unpredictable climatic conditions and lack of proper data analysis. This paper proposes a Smart Crop Prediction System using Machine Learning techniques to assist farmers in making informed decisions. The system analyses environmental parameters such as temperature, rainfall, humidity, soil nutrients, and wind speed to predict suitable crops for specific regions. Machine learning algorithms including Random Forest, XGBoost, and LSTM are applied to improve prediction accuracy. The proposed system helps improve agricultural productivity and promotes sustainable farming practices.

Paper ID:ICA6NT 531

Multimodal Misinformation Detection

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ABSTRACT

The rapid spread of fake news on the Internet has significant social, political, and security problems, which makes accurate automated detection a critical research problem. The situation is further complicated when the disinformation is presented using text and graphics, so the multimodal approaches to learning are required. The proposed work presents a multimodal approach to the identification of misinformation that will simultaneously analyze both the textual and visual aspects of fake news articles. Text data are also subjected to conventional normalization strategies and are modeled by contextual representations of BERT, RoBERTa, XLNet and ELECTRA architectures. Image based disinformation uses identical pipelines based on transformers to extract textual indication of images with the help of OCR. BERT, RoBERTa, XLNet, ELECTRA and a hybrid BERTLSTM architecture are all classification models. Accuracy, precision, recall, F1-score, and confusion matrices are used to assess the performance. In addition, topic modeling is used to identify dominating phrases and, therefore, enhancing forecast interpretability. The interface is based on Flask, which makes real-time multimodal inference possible thanks to the ability to input both text and images. Experimental results show that the ELECTRA model has an outstanding performance in modalities with 99.98% accuracy in text categorization and 88.63% accuracy in misinformation detection of images, outperforming currently existing transformer variations. The findings highlight the effectiveness of optimized pre-training procedures and multimodal integration in reliable detection of misinformation in real life situation.

Keywords— Multimodal misinformation detection, fake news analysis, transformer models, BERT, RoBERTa, XLNet, ELECTRA, OCR-based image understanding

Paper ID:ICA6NT 532

PREDICTING DONOR SELECTION FOR ORGAN TRANSPLANTATION USING ML

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ABSTRACT

Organ Procurement Organizations (OPOs) are central to coordinating organ donation and transplantation processes. However, existing donor selection mechanisms often rely on static administrative protocols, limiting transparency and predictive efficiency. This study proposes a machine learning-driven framework to improve donor selection and multi-organ transplantation prediction using the ORCHID dataset comprising 133,101 donor referral records collected from multiple OPO centers.

Seven classification models were developed to predict donor selection and the likelihood of multi-organ transplantation (defined as transplantation of at least four organs). The models achieved strong performance, with Area Under the Curve (AUC) values exceeding 0.95 for donor selection and above 0.97 for multi-organ prediction.

The findings highlight the influence of administrative milestones and organ-specific indicators on transplantation outcomes.

Paper ID: ICA6NT 533

Artificial Intelligence in Healthcare: Applications, Challenges, and Future Perspectives

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ABSTRACT

Artificial Intelligence (AI) has emerged as a transformative technology in the healthcare sector, enabling improvements in disease diagnosis, treatment planning, patient monitoring, and healthcare management. The integration of machine learning (ML), deep learning (DL), natural language processing (NLP), and data analytics into medical systems has significantly enhanced clinical decision-making and healthcare efficiency. AI systems can process large volumes of medical data, including electronic health records (EHRs), medical images, genomic information, and clinical notes, allowing healthcare professionals to identify patterns that are difficult for humans to detect. These capabilities support early disease detection, personalized treatment strategies, and predictive healthcare models. Recent studies demonstrate that AI-driven diagnostic models often achieve performance comparable to or even exceeding that of medical experts in certain tasks such as radiology and dermatology analysis [1], [2]. However, the widespread adoption of AI in healthcare is accompanied by challenges including data privacy, algorithmic bias, regulatory compliance, and ethical concerns. Addressing these issues requires robust governance frameworks, transparency in AI algorithms, and interdisciplinary collaboration between clinicians, engineers, and policymakers [3], [4]. This paper provides a comprehensive review of AI technologies in healthcare, highlighting their major applications, technological frameworks, challenges, and future research directions. The study aims to provide

researchers and practitioners with a clear understanding of how AI is transforming healthcare systems and what steps are necessary to ensure responsible and effective implementation.

Keywords – Artificial Intelligence, Healthcare Systems, Machine Learning, Deep Learning, Medical Diagnosis, Clinical Decision Support Systems, Medical Imaging, Personalized Medicine.

Paper ID:ICA6NT 535

AUTOMATIC SIGNATURE VERIFICATION USING DEEP LEARNING

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ABSTRACT

Automatic Signature Verification (ASV) systems are crucial for secure authentication in digital environments, where handwritten signatures are electronically captured and verified. These systems use machine learning and deep learning methods to analyse dynamic features such as pen pressure, speed, and stroke order, along with the static shape of signatures. Recent approaches employ techniques like Convolutional Neural Networks (CNNs), Recurrent Neural Networks (RNNs), Generative Adversarial Networks (GANs), and hybrid models to analyse signature characteristics. However, designing real-time systems with reliable performance remains challenging because many deep learning models require retraining when a new user is added to the database. The objective of this work is to develop an ASV system that integrates a CNN-based Siamese Network with a ReactJS-based web interface that allows users to upload and store signatures. The model extracts spatial features and determines authenticity by comparing the uploaded signature with the stored reference signature. The system is designed to handle both genuine and forged signatures through continuous training. By combining preprocessing techniques, feature extraction, and classification methods, the proposed system aims to provide a robust and reliable approach for identity verification in online transactions and other sensitive digital applications.

Paper ID:ICA6NT 537

HEALTHSYNC: SMART DIET SUGGESTION AND DOCTOR BOOKING PLATFORM

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ABSTRACT

Following these developments, the next HDRS will also focus on the concept of cultural and regional diversity, with the recommendations being appropriate in the context of the availability of food in different regions, thereby increasing the chances of compliance with the recommendations. Additionally, the inclusion of feedback loops from wearable devices and continuous glucose monitors will aid in changing the paradigm of recommendations, as the meal plan will be altered based on the user's physiological feedback, thereby changing the paradigm from static recommendations to dynamic recommendations. Furthermore, the next HDRS will also focus on the concept of integrating recommendations using the concept of Explainable AI (XAI) to aid the user in understanding the reason for the recommendation of a particular food item, thereby demystifying the AI's decision-making process. Moreover, the scarcity of data, particularly with regard to the underrepresented, needs to be addressed using the concept of federated learning, wherein the AI is able to learn using decentralized data without compromising the privacy of the user. In this way, the evolution of platforms such as HealthSync will allow for the creation of a digital ecosystem in which individuals are not only able to avoid disease but also possess the knowledge necessary for the proactive maintenance of their overall well-being.

Keywords: Personalized Nutrition, Hybrid, Recommender Systems, Machine Learning, Natural Language Processing, Health-Tech, AI in Healthcare.

Paper ID:ICA6NT 538

A SECURE BLOCKCHAIN FRAMEWORK FOR PRODUCT AUTHENTICATION VIA QR CODES

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ABSTRACT

Counterfeit goods have emerged as a genuine international issue with regards to consumer safety, brand reputation and supply chain transparency. The existing methods of authenticating products are mostly based on a centralized database, barcodes, or hologram labels; these can be duplicated, altered, and changed unauthorizedly. The system redraws the unchangeable product data on the blockchain and confirms whether or not the product record is present and corresponds to the information about registered manufacturers. Smart contracts also provide automated validation and avoid manipulation of data. This prototype implementation is developed in Python using blockchain technology to ensure secure and tamper-resistant product authentication. The experimental assessment shows that the suggested solution enhances traceability, provides product records with the capability to withstand tampering, and allows real-time authentication by individuals. The platform is beneficial in minimizing the chances of fake products being circulated, hence having increased transparency and trust amongst manufacturers, distributors and consumers within the supply chain ecosystem.

Paper ID:ICA6NT 539

Machine Learning Approaches for Melon Growth Prediction

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ABSTRACT

In recent years, climate change and environmental pollution have created major challenges for agricultural productivity and sustainable farming. Melon (*Cucumis melo* L.), an important high-value crop, is highly sensitive to environmental conditions such as temperature, humidity, and sunlight. Because of this sensitivity, accurately predicting melon growth is essential for improving crop management and achieving better yields. This study explores the use of machine learning techniques to predict melon growth in smart greenhouse environments. Several models, including Linear Regression, Random Forest, XGBoost, and Support Vector Regression (SVR), were used to analyze environmental data and estimate key growth parameters such as melon length and width. The models were trained and tested using real-world data collected from smart greenhouses. Their performance was evaluated using Root Mean Square Error (RMSE) and Mean Absolute Percentage Error (MAPE). Among the models tested, XGBoost produced the most accurate predictions, as it was able to capture complex relationships between environmental factors and melon growth. Random Forest also performed well due to its reliability and ability to handle different data patterns. Linear Regression provided a simple baseline for comparison, while SVR showed reasonable performance but required more computational resources for larger datasets. Overall, the results demonstrate that machine learning approaches can effectively support smart greenhouse farming by enabling more accurate crop growth predictions and helping farmers make better data-driven decisions.

Paper ID:ICA6NT 540

DO SYNTHETIC OBFUSCATION CORPORA MATCH PACKED LINUX MALWARE? AN EMPIRICAL STUDY OF STATIC BINARY FEATURES

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ABSTRACT

Researchers studying malware detection and program analysis routinely turn to synthetic corpora generated with source-level obfuscation tools like Tigress. The implicit assumption is simple: Tigress-obfuscated binaries stand in for real-world obfuscated malware. Yet, there is no empirical evidence on whether Tigress actually reproduces the static properties used by detectors when analyzing modern-day Linux threats.

We measured 1,800 Linux ELF malware samples collected between 2020 and 2025, alongside 179 benign binaries and 18 Tigress-based binaries (3 baseline, 15 obfuscated). Our analysis focused on simple static features: section-level entropy, symbol stripping, and section layout. For 1,245 samples where LIEF could parse section structures, we computed per-section entropies; for all 1,800 samples, we computed whole-file entropy. We combined signature-based packer detection (Detect It Easy) with an entropy heuristic for the classification of packed samples.

Three key findings emerged. First, packing is both common and increasing: 29.6% of our samples showed packing or obfuscation, with prevalence rising from 19.7% in 2020 to 39.0% in 2025. Second, packed malware consistently exhibited higher section entropy (mean 6.98) than either benign binaries (6.22) or Tigress-obfuscated binaries (5.90). This gap persisted even when the analysis was limited to x86/x86-64 malware (6.91 vs. 5.90). Third,

our two detection methods captured completely disjoint sample sets: commercial packers with signatures (21.8%) and stripped, high-entropy samples without packer signatures (7.8%), with zero overlap. Tigress matched neither pattern in entropy nor section layout.

The evidence suggests that Tigress, as typically used in academic studies, does not reproduce the static feature distribution observed in contemporary Linux malware. We discuss the implications for detector calibration and benchmarking, and propose practical steps toward building more representative synthetic corpora.

SECURE KEY TRANSMISSION USING QUANTUM-AWARE IMAGE STEGANOGRAPHY FOR POST- QUANTUM CRYPTOGRAPHIC SYSTEMS

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ABSTRACT

With the rise of post-quantum cryptography (PQC), securing key transmission has become essential, especially in distributed and untrusted systems like cloud and IoT. Traditional key agreement methods are either vulnerable to quantum attacks or impose heavy computational overhead. Existing steganographic techniques such as least significant bit (LSB) substitution enable covert communication but lack cryptographic integrity proof, PQC compatibility, and resistance to real-world issues like compression. To address these challenges, we propose a lightweight, tamper-proof, quantum-ready framework for secure key transmission using image steganography. This includes secure random key generation, optional AES encryption or SHA-256 hashing, binary bitstream conversion, and embedding in the image's blue channel via LSB, followed by lossless compression and integrity verification. The framework ensures end-to-end security, visual imperceptibility, and post-quantum readiness. It supports transparent embedding, transmission, extraction, and verification, enabling modular processing at sender and receiver ends. Experiments showed a Peak Signal-to-Noise Ratio above 58 dB and Structural Similarity Index of 0.999, confirming visual fidelity. Key extraction accuracy was 100%, and SHA-256 hashing validated key integrity. This system offers a secure, efficient, and practical solution for future quantum-resilient cloud and IoT communications.

Keywords: Post-Quantum Cryptography, Image Steganography, Secure Key Transmission, LSB Embedding, Cryptographic Integrity Verification.

Paper ID:ICA6NT 542

MACHINE LEARNING BASED FRAUD DETECTION IN UPI TRANSACTIONS

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ABSTRACT

With the rapid expansion of digital banking services, the Unified Payments Interface (UPI) has emerged as a prominent real-time payment system in India. However, the increasing popularity of UPI transactions has led to a surge in fraudulent activities targeting unsuspecting users. Traditional fraud detection systems, often based on single machine learning models or rule-based approaches, struggle to adapt to evolving fraud tactics and suffer from limitations such as low accuracy, poor scalability, and insufficient real-time capabilities. To address these challenges, this research proposes a machine learning-driven fraud detection system that leverages ensemble learning methods to enhance detection accuracy and robustness. By integrating multiple classification models—such as Logistic Regression, Decision Tree, XGBoost, Support Vector Machine, K-Nearest Neighbors, and Naive Bayes—along with advanced ensemble methods like Voting and Stacking Classifiers, the system achieves high accuracy (up to 99.4%) and improved resilience against fraud patterns. The system further incorporates a Flask-based web interface for real-time transaction analysis and secure SQLite-based user authentication, providing users with immediate feedback on the legitimacy of their transactions.

LI-FI ENABLED VEHICLE SAFETY AND COMMUNICATION SYSTEM FOR REAL-TIME HAZARD MITIGATION

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ABSTRACT

Large number of road accidents these days are caused by drunk driving, slow reaction times, and lack of good communication between vehicles. These issues are still a major concern in modern, day transportation systems. The Li-Fi Enabled Vehicle Safety and Communication System described here aims to provide vehicle, to, vehicle communication through optical signals and also help a driver to be aware of hazards in the surroundings. The system suggested in the paper uses instruments for detecting impairment of a driver such as alcohol sensor and eye, blink monitor to continuously measure driver alertness and cabin environmental safety. If the system locates any dangerous conditions like intoxication, drowsiness, or abnormal driving behavior, it immediately triggers local warning alerts and starts optical communication via the Li-Fi technology to inform the nearby vehicles .Li-Fi provides low, latency, secure, and interference, free data transmission through visible light modulation, unlike traditional RF, based communication systems. The Arduino Uno is the main coordinator or central processing unit that manages sensor data grabbing, hazard evaluation, alert triggering, and motor control operations. An automatic vehicle control system through a motor driver interface limits a vehicle's speed in case of an emergency to reduce the risk of accident. In order to co, increase awareness of the danger on the roads in a broader sense, hazard info is transmitted simultaneously via the Li-Fi transmitter to the receiving vehicle.

By integrating sensing, automated control, and optical communication, each car is converted into a node in a distributed safety network among vehicles. Testing of the system under controlled settings, it was found that hazardous situation recognition was dependable, responsiveness to alert very sensitive, and light, based, communication was stable. The system contributes to the intelligent transportation safety aspect by enabling vehicles to collaborate with each other instead of each vehicle functioning as an isolated unit, thus creating a cooperative safety network among the vehicles on the road.

Paper ID:ICA6NT 544

Computer Vision and Artificial Intelligence

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ABSTRACT

Computer Vision and Artificial Intelligence (AI) are rapidly advancing technologies that enable machines to interpret and understand visual information from the real world. Computer vision focuses on enabling computers to process and analyze digital images and videos, while artificial intelligence provides the ability for machines to learn from data and make intelligent decisions. The integration of computer vision with AI has significantly improved the performance of systems in areas such as object detection, facial recognition, medical image analysis, autonomous vehicles, and security surveillance. This paper presents an overview of computer vision and artificial intelligence, discusses their core techniques, and highlights their major applications. Additionally, the proposed work explains how deep learning models can enhance visual recognition systems and improve accuracy in real-world environments.

ENHANCING INSIDER THREAT DETECTION USING ENSEMBLE MACHINE LEARNING MODELS

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ABSTRACT

In recent years, insider threats have become one of the most serious cybersecurity concerns for organizations. Unlike external cyberattacks that originate outside the network, insider threats are carried out by individuals who already have legitimate access to organizational systems, such as employees, contractors, or trusted partners. Because these users operate within the organization's security boundaries, their activities often resemble normal user behaviour, making insider threats difficult to detect using traditional security mechanisms. To address this challenge, this study proposes a machine learning-based approach for detecting insider threats by analysing patterns in user behaviour. The research utilizes the widely recognized CERT insider threat dataset, which contains detailed records of employee activities such as logins, file access, device usage, and system interactions. By examining these behavioral patterns, machine learning models can identify abnormal activities that may indicate potential insider threats. Several supervised machine learning algorithms are implemented and evaluated, including Logistic Regression, Decision Tree, Random Forest, Support Vector Machine (SVM), K-Nearest Neighbors (KNN), Naïve Bayes, AdaBoost, and XGBoost. Since insider threat datasets are typically highly imbalanced, the Synthetic Minority Oversampling Technique (SMOTE) is applied to balance the dataset and improve the detection of rare malicious events. Experimental results show that ensemble learning models perform better than traditional methods. In particular, Random Forest and AdaBoost achieve the best performance with an accuracy of **97.5%**, demonstrating their effectiveness in detecting insider threats and improving cybersecurity monitoring systems.

Paper ID:ICA6NT 547

DESIGN AND IMPLEMENTATION OF AN INTELLIGENT MULTI-MODE ENERGY RECOVERY SYSTEM FOR ELECTRIC VEHICLES

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ABSTRACT

Electric vehicles (EVs) play a crucial role in reducing fuel dependency and environmental pollution; however, limited battery capacity and restricted driving range remain significant challenges. This paper presents a smart multi-mode energy recovery system that integrates continuous energy harvesting, regenerative braking, and intelligent dual-battery energy management to improve overall efficiency. The proposed system operates in three distinct modes: continuous energy harvesting mode, regenerative braking mode, and driving mode. During downhill motion without acceleration input, the BLDC motor operates as a generator to harvest energy using electromagnetic induction principles. In regenerative braking mode, kinetic energy during braking is converted into electrical energy and stored in the battery. During driving mode, the battery supplies power for propulsion. The system incorporates a dual-battery configuration with threshold-based load shifting, where one battery supplies the load while the other stores recovered energy. When the active battery reaches a predefined minimum state-of charge, automatic switching transfers the load to the charged battery to ensure uninterrupted operation and balanced charging cycles. Intelligent mode selection based on terrain conditions and driver inputs enhances total energy recovery, improves battery utilization, and extends the effective driving range of electric vehicles.

Paper ID:ICA6NT 548

ENHANCING CAMPUS PLACEMENT DECISIONS USING PREDICTIVE MACHINE LEARNING MODELS

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ABSTRACT

A prediction method for campus placements is designed to determine the likelihood that a student will be hired by a firm after completing a campus placement process. The model considers numerous parameters to estimate the student's ability level. Some data is collected from examinations conducted through the placement management system, while other information is obtained from college-level records such as academic performance, CGPA, projects, internships, and HSC and SSC marks.

This placement prediction technique aims to assist students in improving their academic performance and outcomes, while also helping them develop soft skills that can enhance their placement chances. The reputation and annual admissions of an institute are often dependent on the placement success of its students. Therefore, most institutions actively work to strengthen their placement departments.

The goal of this study is to analyze previous years' student placement data and use it to predict the likelihood of current students being placed on campus. For this purpose, multiple machine learning algorithms, including Logistic Regression, Decision Tree, and Random Forest, have been evaluated to determine their effectiveness.

Paper ID:ICA6NT 549

AI-ENABLED MEDICAL CONSULTATION CHATBOT

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ABSTRACT

The study presents a sophisticated medical chatbot that uses vector-based retrieval and Meta's LLaMA 2 model to provide accurate, context-aware recommendations on symptoms, drugs, and diets. The system integrates Pinecone for vector embeddings, LangChain for managing interactions, and Python for implementing the core logic. A 637-page medical dataset, "The GALE Encyclopaedia of Medicine," is segmented into smaller text chunks to enable efficient semantic search. Flask is used to build the web infrastructure, while Streamlit provides the user interface for interacting with the chatbot. When users submit queries, the system generates embeddings, performs vector searches, and uses LLaMA 2 to generate relevant responses. Although challenges such as handling edge cases and maintaining data quality exist, the evaluation focuses on accuracy, response time, and user engagement. Future improvements include real-time updates and advanced fine-tuning techniques. Compared with other models, Gamma LLM v2 demonstrates superior performance in language understanding, generation, and reasoning, enabling fine-tuning on custom datasets and reducing reliance on external APIs. In medical question-answering tasks, it outperforms models such as RoBERTa (0.77), BERT (0.86), and MedBERT (0.95), and is available in 7B, 13B, and 70B parameter variants.

Paper ID:ICA6NT 553

ARM-Based Industrial Monitoring and Safety Control System Using STM32 Microcontroller

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ABSTRACT

A complete system that can monitor industrial environments automatically and observe parameters such as gas leakage, temperature changes, flame detection, and water leakage is proposed. To ensure industrial safety and quick hazard detection, the system uses integrated sensors, relay modules, and an ARM-based STM32 microcontroller. The designed system ensures safe and reliable industrial monitoring through the use of integrated sensors, automated relay control, and real-time hazard detection.

Keywords: Industrial Monitoring System, Gas Sensor, Temperature Sensor, Flame Sensor, Automation

Paper ID:ICA6NT 554

SMART PHONE GUARD: AUTOMATED MOBILE PHONE DETECTION IN RESTRICTED ZONES

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ABSTRACT

Unauthorized mobile phone usage in restricted areas such as examination halls, hospitals, and government offices poses serious concerns related to security, privacy, and discipline. Most existing detection systems rely on monitoring radio frequency signals, which become ineffective when devices are switched off or placed in airplane mode. To address this limitation, we propose *Phone Patrol*, a vision-based mobile phone detection system built using deep learning techniques. The system employs YOLOv5 to identify individuals using mobile phones and YOLOv9 to recognize the person involved. It is deployed on a Raspberry Pi 5, enabling real-time video processing in a compact and low-cost edge computing setup. Upon detecting a violation, the system automatically sends an SMS alert to the identified individual. Experimental results demonstrate strong detection performance, achieving an mAP50 score of 0.992 for mobile phone detection. Although currently implemented as a prototype, the system demonstrates a practical and scalable approach for enforcing no-mobile policies effectively.

Paper ID:ICA6NT 555

Comparative Analysis of Transistor and Arduino-Based Irrigation System

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ABSTRACT

This paper presents a comparative analysis of transistor-based and Arduino-based automatic irrigation systems, with an emphasis on design architecture, performance efficiency, cost, and scalability. The transistor based system employs discrete components for soil moisture sensing and control logic, offering a low cost and power efficient solution with limited adaptability. In contrast, the Arduino based system leverages a microcontroller platform to enable programmability, real-time monitoring, and irrigation with additional sensors and communication modules. Experimental evaluation was conducted under controlled conditions to assess parameters such as water usage efficiency, response time, system complexity, and reliability. Results indicate that while the transistor based approach is suitable for basic irrigation tasks in low resource settings, the Arduino based system provides enhanced functionality and is better suited for smart agriculture applications requiring flexibility and precision. This comparative study aids in selecting appropriate irrigation automation technologies based on specific operational and environmental requirements.

Paper ID:ICA6NT 556

An Intelligent Framework for WhatsApp Chat Analysis and Visualization using Natural Language Processing and Sentiment Analysis

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ABSTRACT

The rapid growth of digital communication has made messaging platforms such as WhatsApp an essential part of everyday interaction. However, the informal and unstructured nature of chat data creates difficulties in interpreting sentiment, identifying trends, and visualizing communication patterns. This paper presents an effective framework for analyzing and visualizing WhatsApp chat data using Natural Language Processing (NLP) methods, Python libraries, and sentiment analysis techniques. The proposed system first removes unnecessary elements such as system messages and irrelevant content to reduce noise. It then performs sentiment analysis using the VADER model to identify the emotional tone of conversations, along with keyword frequency analysis to detect common discussion trends. To make the results easier to understand, the system generates visual representations including word clouds, activity maps, and bar charts. The application is deployed through a user-friendly web interface on the Heroku platform, allowing users to conveniently explore and analyze their chat data. Experimental results show that the proposed model achieves a 15% improvement in sentiment classification accuracy and a 20% increase in processing efficiency compared to existing tools. Overall, the system provides a comprehensive solution that helps users better understand communication patterns, emotional expressions, and participant engagement within WhatsApp chats.

Keywords: WhatsApp Chat Analysis, Natural Language Processing (NLP), Sentiment Analysis, VADER Sentiment Model, Data Visualization, Heroku Deployment.

Paper ID:ICA6NT 557

A VISION BASED INTELLIGENT SYSTEM FOR REAL TIME DRIVER DROWSINESS DETECTION

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ABSTRACT

Driver fatigue and drowsiness pose significant risks to road safety, necessitating advanced monitoring systems to mitigate accidents. This research addresses this concern through the implementation of a Real-Time Driver Drowsiness Monitoring system using Vision Transformer (ViT). The study involved fine-tuning a Vision Transformer (ViT) model with additional layers on a dataset comprising 84900 images of open and closed eyes, enabling accurate detection of driver drowsiness. The motivation for drowsiness detection stems from the critical role of attentiveness in driving safety. Existing alarm systems often rely on conventional methods, and the research seeks to enhance this by incorporating state-of-the-art ViT technology. Achieving an impressive accuracy of 98.8%, the real-time monitoring system uses the ViT model to detect driver drowsiness promptly. When drowsiness is detected, an alarm is triggered to alert the driver, promoting immediate attention, and reducing the risk of accidents. The model's performance is also thoroughly evaluated, demonstrating high precision, recall, and F1-Score for both closed and open-eye states. This study benefits the field of driver safety by providing a reliable and effective real-time drowsiness monitoring method, thus enhancing road safety, and reducing the incidence of fatigue-related accidents.

Paper ID:ICA6NT 558

AN INTELLIGENT CLOUD-BASED SYSTEM FOR REAL-TIME TRAFFIC PREDICTION AND ROUTE OPTIMIZATION USING MACHINE LEARNING

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ABSTRACT

Rapid urbanization and the increasing number of vehicles on road networks have resulted in severe traffic congestion, making efficient traffic management a critical challenge for modern cities. To address this issue, this project proposes a Real-Time Traffic Prediction and Optimization System that utilizes machine learning techniques to analyze and forecast traffic conditions. The system integrates real-time data from multiple sources such as GPS devices, traffic sensors, and weather APIs to obtain comprehensive traffic information. These data inputs are processed and analyzed using machine learning algorithms to accurately predict traffic density and congestion levels. Based on the predicted conditions, the system provides optimized route recommendations and adaptive signal control strategies to improve traffic flow and reduce travel delays. The architecture is designed using a cloud-enabled framework that ensures scalability, efficient data handling, and seamless integration with existing smart city infrastructures. An interactive dashboard is also implemented to visualize live traffic conditions, predictive insights, and system performance metrics, enabling traffic authorities to make informed and timely decisions. Experimental evaluation of the proposed model demonstrates improved traffic prediction accuracy and better congestion management compared to traditional traffic control approaches. The system contributes to reduced travel time, optimized fuel consumption, and enhanced urban mobility, highlighting the potential of intelligent data-driven solutions for future smart transportation systems.

Paper ID:ICA6NT 559

Healthvista-AI : An AI-Driven Healthcare Assistant For Multi-Disease Risk Prediction & Personalized Medical Recommendations

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ABSTRACT

The growing incidence of chronic diseases such as heart disease, diabetes, and kidney disorders has accelerated global interest in intelligent healthcare systems that can assist in early diagnosis and preventive treatment . Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL) have converged to strengthen disease prediction using data-driven models to produce precise results from vast and complex medical datasets. This review paper gives detailed assessment of existing AI approaches and technological contexts in disease prediction and management framework approaches, focusing on models for life threatening diseases such as cardiovascular diseases, chronic kidney disease, and diabetes mellitus. Studies reveal the successful application of algorithms such as Support Vector Machines (SVM), Random Forest (RF), Logistic Regression (LR), Artificial Neural Networks (ANN), and Convolutional Neural Networks (CNN) in identifying relevant medical scenarios and risk factors from patient characteristics, physiological parameters, and laboratory results. A comparative assessment also provides indications that deep learning models, CNNs, and ensemble model contexts can outperform traditional classifiers in prediction accuracy and generalization characteristics, though they would impose an additional requirement of data size and computational resources. In addition to the assessment of models employed in the comparison, study findings shows that data preprocessing, feature selection, and hyper-parameter tuning are critical factors influencing prediction performance. In conclusion, findings from the studies included in this review

suggest that integrating AI with user-centered technologies (i.e. web-based platforms or applications using APIs) may enhance access to practice-based resources and provide clinical decision supports in real-time. A case example of an AI-enabled web platform that integrates Streamlit, geolocation APIs, and YouTube Data APIs will be provided as one specific example of the potential associated with predictive modelling along with preventive healthcare education. Overall, this interdisciplinary synthesis illustrates that AI based disease prediction systems may play an important role in advancing precision medicine through early intervention, remote patient monitoring, and empowerment. Many barriers exist to clinical adoption including data imbalance, a lack of interpretability, and challenges related to the ethical use of data. Future research areas should include the roles of explainable AI (XAI), federated learning, and multimodal data fusion to engage in transparent, secure, and globally-scalable healthcare systems.

Keywords: Healthcare , Machine Learning ,GPS , Random Forest , CNN

Paper ID:ICA6NT 560

DIGITAL PLATFORM FOR CENTRALIZED ALUMNI DATA MANAGEMENT AND ENGAGEMENT USING JS

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ABSTRACT

Managing alumni information remains a challenge for many educational institutions due to scattered and outdated record-keeping practices. Alumni data is often maintained across informal platforms, making long-term engagement and retrieval difficult. This project presents a Digital Platform for Centralized Alumni Data Management and Engagement, designed to store and manage alumni information in a secure and unified system. The platform assigns a lifetime Alumni ID to each student and maintains structured profiles containing academic, career, and contact details. It supports easy search and reconnection using limited information, along with role-based access to ensure data security and privacy. By centralizing alumni records and enabling continuous engagement, the system strengthens institutional-alumni relationships and supports the development of a scalable and sustainable alumni network.

Paper ID:ICA6NT 561

ENHANCING CYBERSECURITY THROUGH GENERATIVE AI BASED THREAT INTELLIGENCE

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ABSTRACT

Generative Artificial Intelligence (AI) is transforming modern cybersecurity systems by providing intelligent mechanisms for identifying and responding to cyber threats. This paper explores the role of generative AI in enhancing threat intelligence systems and improving cybersecurity measures within organizations.

Generative AI models can analyze large volumes of security data, identify hidden patterns, and generate predictive insights that help security teams detect malicious activities in real time. The proposed approach focuses on automated threat detection, improved anomaly detection, and adaptive response mechanisms using generative AI techniques. Comparative analysis with existing algorithms such as DCGAN, WGAN, BERT, and SPADE demonstrates improved accuracy and efficiency in cybersecurity threat analysis. The results highlight the importance of integrating generative AI models into modern security infrastructures to strengthen defense mechanisms against evolving cyber threats.

Paper ID:ICA6NT 562

Analysis of Depression Risk

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ABSTRACT

This paper presents an intelligent and data-driven system for the **Analysis of Depression Risk** using advanced Machine Learning techniques. Depression is one of the most common and serious mental health disorders affecting people across different age groups, particularly students and working professionals who often face academic pressure, career uncertainty, workload stress, and social challenges. In today's fast-paced environment, mental health issues frequently go unnoticed until they become severe. Therefore, early identification of depression risk plays a crucial role in providing timely emotional support, counseling, and preventive care before the condition worsens. The proposed system focuses on analyzing multiple behavioral, lifestyle, and psychological factors that are commonly associated with depression. These factors include sleep patterns, academic pressure, work-related stress, level of social interaction, daily habits, and emotional state. By collecting and examining these attributes, the system aims to detect patterns that may indicate a higher likelihood of depression. Instead of relying solely on subjective observation, this approach uses data-driven insights to support more objective and consistent evaluation. Unlike traditional psychological assessments, which often require manual evaluation by mental health professionals through interviews and questionnaires, the proposed system automates the analysis process using supervised machine learning models. The system accepts user-provided inputs, performs data preprocessing such as cleaning, encoding, and normalization, and then applies trained classification models to estimate the individual's depression risk level. Various machine learning algorithms are evaluated to determine the most accurate and reliable model for prediction. Experimental results demonstrate

promising levels of accuracy, precision, and reliability in identifying individuals who may fall into moderate or high-risk categories. The system is designed not as a replacement for professional diagnosis, but as a supportive and preliminary screening tool that can assist in early detection and awareness.

Overall, this project highlights how machine learning can be effectively applied in the field of mental health risk assessment. By combining technology with psychological indicators, the system contributes toward creating accessible, efficient, and scalable solutions that promote early intervention and mental well-being.

Keywords:Digital Twin, Healthcare Assistant, LLaMA.cpp, Medical Report Analysis, Prescription Interpretation, Offline AI, Privacy-Preserving System, Intelligent Healthcare

Paper ID:ICA6NT 563

REIMAGINING AUTHENTICATION: A USER-CENTRIC TWO-FACTOR AUTHENTICATION USING PERSONALIZED IMAGE VERIFICATION

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ABSTRACT

As digital platforms continue to grow, ensuring secure user authentication has become a critical requirement. This paper proposes a user-centric two-factor authentication (2FA) system that combines traditional login credentials with personalized image-based verification. During account creation, users register their username and password and select personal images associated with specific keywords. During authentication, the user enters their password and uploads the image corresponding to the displayed keyword to complete the verification process.

To strengthen security, the system restricts authentication attempts differently for known and unknown devices. Image verification is performed using the Perceptual Hashing (pHash) algorithm, which enables efficient and storage-friendly image comparison. In addition, Convolutional Neural Networks (CNN) are used to extract deep visual features for semantic image verification. The system also provides an optional facial recognition feature that can be used for account recovery when a user forgets their password or image credential. By combining pHash, CNN-based verification, and optional face recognition, the proposed system improves authentication reliability while maintaining a user-friendly experience.

Paper ID:ICA6NT 564

Digital Roots: Bridging Indigenous Wisdom with Modern Computing through AI and 6G Networks in Bastar

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ABSTRACT

As the global technological landscape transitions towards Artificial Intelligence (AI) and Sixth-Generation (6G) communication networks, marginalized communities often remain excluded from the digital revolution. This paper introduces the "Digital Roots" framework, a conceptual and technological model designed to empower the indigenous tribal populations of the Bastar region in Chhattisgarh. By synergizing modern computing with traditional ecological knowledge, this research outlines practical AI applications – ranging from Natural Language Processing (NLP) for under-resourced languages like Gondi and Halbi, to AI-driven supply chain optimization for Non-Timber Forest Produce (NTFP). Furthermore, it examines how the ultra-reliable, low-latency communication (URLLC) and ubiquitous coverage promised by 6G networks can overcome the severe infrastructural deficits of dense forest topographies. Ultimately, this paper argues for an ethically grounded approach to technology deployment, ensuring indigenous data sovereignty while utilizing smart computing for sustainable socio-economic development.

Keywords: Artificial Intelligence, 6G Networks, Tribal Development, Natural Language Processing, Digital Divide, Indigenous Knowledge.

Paper ID:ICA6NT 566

SKILLSWAP USING END TO END SYSTEM

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ABSTRACT

In the rapidly evolving digital ecosystem, continuous skill development has become essential for academic and professional growth. However, existing online learning platforms such as Coursera and Udemy primarily operate on paid instructor-driven models, limiting accessibility and peer collaboration. Similarly, freelancing platforms like Fiverr and Upwork focus on monetary transactions rather than knowledge exchange. This paper proposes SkillSwap, an end-to-end system designed to enable peer-to-peer skill exchange, collaborative task execution, and structured paid mentorship within a unified platform. The system integrates an intelligent matching algorithm, reputation-based trust model, task lifecycle management, and commission-based monetization. By combining skill swapping, task collaboration, and paid learning modules, the proposed system creates a scalable and sustainable digital learning ecosystem. Experimental evaluation indicates improved accessibility, enhanced collaboration efficiency, and optimized skill matching compared to conventional platforms.

CODEJAM: AI-POWERED REAL-TIME CODE COLLABORATION PLATFORM FOR DISTRIBUTED TEAMS

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ABSTRACT

CodeJam is an AI-powered real-time code collaboration platform designed for distributed teams, students, and developers working in remote environments. Traditional development workflows often rely on multiple disconnected tools for coding, communication, and debugging, leading to delays, reduced productivity, and inefficient collaboration. CodeJam solves this problem by providing a unified platform where multiple users can collaboratively write, edit, and execute code with real-time synchronization. The system integrates artificial intelligence to provide intelligent code suggestions, error explanations, and debugging support, improving coding efficiency and learning outcomes. Real-time communication is supported through live chat, presence indicators, and collaborative editing using WebSocket-based networking. By combining AI-assisted development with real-time collaboration, CodeJam provides an effective solution for modern distributed software development and collaborative learning.

Fraud Detection in Banking Data by Machine Learning Techniques and Deep learning

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ABSTRACT

Financial institutions are increasingly employing intelligent analytics to identify fraudulent transactions and ensure the economic losses are minimal in the digital banking context. More complex and dynamic fraud patterns in data sets of highly skewed transactions are, in turn, difficult to detect using traditional rule-based and statistical techniques. With machine and DL, a credit card fraud dataset available in Kaggle is trained to create a powerful system to detect fraud. There are several steps the dataset passes through until it is used. These will involve removing duplicates, cleaning data, visualizing the data using Matplotlib and Seaborn, selecting features using SelectKBest and correcting class skew using the SMOTE-ENN algorithm. Once the features have been selected, they are divided into training and testing groups to facilitate a model building. Some of the models used include LSTM,GRU, MLP, RF, DT and KNN. The hybrid architecture that involves a combination of LSTM, GRU, and MLP is also present. Ensemble voting algorithm, which is the combination of KNN, LightGBM, and soft voting, is applied to enhance the accuracy of prediction. The measures of a model working are accuracy, precision, memory, and the F1-score. The voting classifier is better than the individual and the hybrid models according to the findings of the experiments with a score of 99.9% on all the measures of evaluation. The prediction of theft in real time is achievable through an interactive interface using Flask and SQLite and makes it more applicable to the banking environment.

“Keywords— Credit Card Fraud Detection, Machine Learning, Deep Learning, Data Preprocessing, Class Imbalance Handling, Ensemble Learning.”

Paper ID:ICA6NT 572

DIGITAL FORENSICS FRAMEWORKS AND LEGAL COMPLIANCE IN CYBERCRIME INVESTIGATION

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ABSTRACT

The exponential growth of digital technologies has both facilitated and complicated the investigation of cybercrimes. Digital forensics, therefore, plays a pivotal role in navigating the intersection of technology and law. This paper delves into the nuances of legal standards and practices within cybercrime investigations. It highlights the necessity for rigorous adherence to legal procedures in the digital evidence gathering, the challenges posed by the sophistication of cybercrime, and the ethical considerations that arise in the pursuit of justice. Through a detailed analysis of digital forensics reports, this study reveals prevalent issues at various levels of cybercrime investigation and the need for harmonized legal frameworks to ensure effective and just prosecution of cybercrimes.

Paper ID:ICA6NT 573

Adaptive Reinforcement Learning for Smart Home Security with Multimodal Threat Detection

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ABSTRACT

With the growing usage of CCTV cameras in houses, to prevent theft it is important for an upgrade for security cameras from traditional monitoring systems to new adaptive method. This research focuses on integrating Reinforcement Learning with live security camera footage, vibrations and audio data to make adaptive decisions. Unlike traditional CCTVs which relies on external monitoring and cloud integration, this project runs on edge devices like Raspberry PI 5 and relay any threats directly to the user through telegram bot. Based on the user response for the telegram bot notification the model gets trained again and provides personalized monitoring.

Keywords- Smart Home Security, On Device Learning, Adaptive Reinforcement Learning, Multimodal threat detection, Telegram Bot, Computer Vision, YOLOv5, Edge Computing, Personalized Security Detection.

Paper ID:ICA6NT 574

AN INTELLIGENT SOFTWARE AGENT FOR INTERVIEW AUTOMATION

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ABSTRACT

As the field of Conversational AI is advancing rapidly, introducing automated intelligent software agents in human interactions can exhibit human-like communicative behaviors facilitating in more natural and engaging interactions with humans. These advancements provide opportunities to automate the candidate interview process by replacing human interviewers with intelligent autonomous software agents. Using Conversational AI, agents can ask questions, understand and evaluate response and initiate dynamic conversations closely resembling human interviewers. This automation enhances the efficiency of the overall interview process and ensures consistent and unbiased evaluation leading to more effective and fair hiring practices. This research paper aims to present a comprehensive study on the development and implementation of an AI-driven interview system designed to conduct candidate evaluations in realtime. The system integrates multiple AI agents, each performing different roles such as selecting predefined questions, evaluating candidate response, analyzing speech to assess emotions and sentiments, and synthesizing these analysis to provide separate scores for answers and emotions in the performance assessment.

Paper ID:ICA6NT 575

SMART DIGITAL LEARNING PLATFORM FOR RURAL SCHOOLS

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ABSTRACT

Education in rural areas faces many challenges such as poor internet connectivity, lack of digital infrastructure, and limited access to quality learning resources. Traditional learning methods often fail to provide digital skills required in modern education. This paper proposes a **Smart Digital Learning Platform for Rural Schools** that supports offline learning and provides accessible educational content for students. The system allows students to download lessons and access them without internet connectivity. Teachers can monitor student progress and manage learning content efficiently. The platform is optimized for low-end devices and supports local language content. The proposed solution helps bridge the gap between rural and urban education systems and improves digital literacy among rural students.

Paper ID:ICA6NT 578

A MULTIMODAL AI FRAMEWORK FOR DATASET QUALITY EVALUATION WITH RISK AND BIAS DETECTION FOR INTELLIGENT MODEL RECOMMENDATION

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ABSTRACT

This paper presents a comprehensive intelligent framework for machine learning dataset evaluation and model recommendation with the aim of promoting the efficiency, accuracy, transparency, and fairness of AI systems for both expert and non-expert users. Our system includes a novel six-component trainability scoring system for evaluating the completeness of the dataset, quality of features, adequacy of the dataset size, duplication detection, prevalence of outliers, and the balance of classes. Our system also includes advanced multimodal analysis for structured, text-based, and image-based datasets. Our system performs dual-layer statistical analysis for accurate dataset characterization and relationship identification while incorporating crucial risk and bias detection modules for detecting potential issues with the dataset, including class imbalance, noise, redundancy, etc. Our system allows users to score datasets for various machine learning tasks while recommending the most appropriate machine learning algorithms through a context-aware algorithm with prioritized improvement suggestions with predicted impact.

Paper ID:ICA6NT 579

IoT- Based Non-Contact Vital Signs Monitoring System for Remote Healthcare Applications

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ABSTRACT

Continuous monitoring of physiological parameters is essential for early detection of health abnormalities and effective patient care. Conventional monitoring systems typically rely on contact-based sensors, which may cause discomfort, require frequent maintenance, and increase the risk of contamination in clinical environments. To address these limitations, this paper presents an IoT-enabled non-contact vital signs monitoring system designed to observe essential physiological parameters without direct physical contact with the patient. The proposed system integrates non-contact sensing technologies with an embedded microcontroller platform to detect vital indicators such as heart rate, respiration rate, and body temperature. The sensed data are processed by the microcontroller and transmitted through a wireless network to a cloud-based monitoring platform using Internet of Things (IoT) communication protocols. Healthcare professionals or caregivers can access the real-time data through a web or mobile interface, enabling continuous remote monitoring and timely intervention when abnormal readings are detected. The system architecture emphasizes reliability, low cost, and ease of deployment, making it suitable for home healthcare, hospital wards, and elderly care environments. By eliminating the need for physical contact while enabling real-time data transmission and visualization, the proposed solution contributes to improved patient comfort, enhanced hygiene, and efficient remote healthcare management.

Keywords— Internet of Things, Non-Contact Monitoring, Vital Signs, Embedded Systems, Remote Healthcare.

Paper ID:ICA6NT 581

A SURVEY ON MULTIMODAL COGNITIVE LOAD AND STRESS DETECTION USING FACIAL EXPRESSION AND GSR SIGNALS

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ABSTRACT

Estimating cognitive load and stress in the real time is a growing research area with a broad applications in education field and healthcare field. This survey reviews about the contemporary approaches that rely on two less-cost models visual face analysis from web cam and electrodermal activity measured through Galvanic Skin Response (GSR) sensors and places them in the context of multimodal cognitive monitoring. We categorize methods by sensing modality, feature extraction, and model architecture, compare common datasets and evaluation protocols and identify technical and practical limitations of real-world classroom deployment,[3], [7], [8]. Our analysis reveals a gap, most high-accuracy systems rely on invasive or costly sensors (e.g., EEG) while real-time, less-cost multimodal solutions remain under developed. We close by recommending promising directions robust fusion strategies, baseline normalization, privacy-preserving architectures, and standardized classroom protocols that can guide future work and motivate the proposed methodology of this project.

Paper ID:ICA6NT 582

EMOTION BASED MUSIC RECOMMENDATION SYSTEM WITH REAL-TIME GESTURE CONTROLLED INTERACTION

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ABSTRACT

This paper proposes an intelligent emotion-driven music recommendation system along with real time gesture-controlled interaction. Unlike the conventional music streaming systems that use only the historical behaviour of the user or manual selection of the music by the user, the proposed system adjusts dynamically to the current emotions of the user through real-time facial emotion recognition. The proposed system utilizes the DeepFace technique for recognizing the emotions of the user through real-time video input. Moreover, the proposed system utilizes computer vision techniques for recognizing predefined hand gestures for controlling the music playback system without any physical contact. The proposed system architecture is based on the client-server model. The proposed system achieves 94% accuracy in emotion detection and 85% accuracy in gesture recognition under controlled environments. The proposed system utilizes the concept of affective computing along with hands-free interaction to provide an immersive music experience to the end-user.

Paper ID:ICA6NT 583

AI-POWERED CHEST X-RAY ANALYSIS & REPORT GENERATION

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ABSTRACT

Although the chest x-rays is a very significant medical instrument of identifying diseases within the thorax, it is still manually interpreted and reported, which is very time consuming and inaccurate. The recent advancements in DL and vision-language modeling have ensured that CXR images can be automatically assessed and clinically sensible reports generated. In this paper, the author demonstrates how X-rays of the chest can be analyzed and a report made using AI. It is a combination of language models and visual encoders, which are transformer-based. Swin Transformer (SWIN), ConvNeXt, EfficientNet and ResNet are visual backbones that are tested to classify the disease. In case of generation of medical reports, ViT+BART, ViT+GPT2, Swin+BART, and Swin+GPT2 multimodal designs are applied. Diagnostically important areas are depicted by the use of grad-CAM and explainability is included. To be classified, the performance is measured using Accuracy, Precision, Recall, and the Macro F1-score. In the case of text generation, there are BLEU, ROUGE-1, ROUGE-2, ROUGE-L, and BERTScore-F1. SWIN model is best classified with a rate of 76.56% whereas ViT+BART design has BLEU 12.78%, ROUGE-1 42.26, ROUGE-2 17.30, ROUGE-L 32.58 and BERTScore-F1 88.89. A web interface based on Flask allows one to make conclusions in real time and automatically send structured reports, which facilitates both scalable deployment and a reduced understanding curve among clinicians.

Paper ID:ICA6NT 587

RECENT ADVANCES IN UAV-BASED SMALL OBJECT DETECTION: A COMPREHENSIVE SURVEY

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ABSTRACT

The Unmanned Aerial Vehicles (UAVs) are now a significant platform where different real world applications like traffic checks and control, disaster management, surveillance, environmental surveillance, and precision agriculture are being realized. UAVs provide high field of view since they take aerial pictures at a high altitude, but the observation of objects in high altitude aerial images is quite a difficult task. The major challenges are object small sizes, concentrated object patterns, scale changes, motion blur, occlusions, and intricate backgrounds. Conventional object detectors that use handcrafted features tend not to be able to locate these small objects in aerial photographs. Over the past few years, deep learning-based systems have greatly enhanced the level of object detection, especially with the implementation of Convolutional Neural Networks (CNNs), Vision Transformers and hybrid-based systems. The survey gives a full overview of the recent developments in small object detection by UAVs. It discusses different detection models such as two-stage detectors such as Faster R-CNN models and single-stage detectors such as YOLO models, and emerging transformer based models that are aimed at improving feature extraction and multi-scale representation. Some of the standard benchmark datasets that are commonly utilized in the study of UAV object detection are also covered in the survey, such as VisDrone and UAVDT, as well as standard measures of evaluation, such as precision, recall, Intersection over Union (IoU), and the mean Average Precision (mAP). Moreover, the paper emphasizes the benefits and drawbacks of various methods and focuses on the up-to-date trends in lightweight and real-time detection models that can be used on the edge devices. Lastly, the research issues and future research directions are

discussed to promote the design of more precise, effective and robust UAV object detection systems.

Paper ID:ICA6NT 588

A Tree-Based Intrusion Detection Framework for Intelligent Network Threat Analysis

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ABSTRACT

Intrusion Detection Systems (IDS) is critical towards detection and prevention of cyber-attacks in networked environments. Existing solutions such as AI@NTDS and Tree-Based IDS are in the process of being preoccupied with SSS and Telnet protocols, and are based on fixed feature sets and datasets. These constraints decrease their flexibility to emerging dangers as well as their appropriateness in a variety of protocols and environments. This paper will introduce a more advanced IDS system, referred to as TreeIDS++, that will utilize dynamic features selection, support of multiple protocols (SSH, HTTP, and DNS) and intelligent learning to adapt to new patterns of attack. The system will use tree-based machine learning model: LightGBM and will implement explainability methods like SHAP to make its threats' reasoning transparent. Additionally, it presents a new Threat Prioritization Index (TPI) to prioritize the threats by their behavior, origin, and risk, thus responding to them more effectively. The model is tested on a mixture of real and simulated data, both custom honeypot generated traffic and is applicable to the implementation of modern enterprise and IoT networks. Tree-IDS++ has more interpretable, flexible and comprehensive method of intrusion detection in dynamic network settings by overcoming the limitations of the previous systems.

Index Terms—Intrusion Detection System, Tree-based Machine Learning, Multi-Protocol Network Security, Honeypot Analysis, Explainable AI, Threat Prioritization.

Paper ID: ICA6NT 589

Data-Driven Prediction of Hospital Stay Length Using Interpretable ML Models

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ABSTRACT

Efficient hospital resource management is essential for improving patient outcomes and reducing healthcare costs. This paper proposes an explainable machine learning framework for predicting hospital length of stay (LOS) using electronic health record (EHR) data. Multiple machine learning models including Logistic Regression, Support Vector Machine, Random Forest, and XGBoost are evaluated. The study integrates explainable AI (XAI) techniques to improve transparency in clinical decision-making. Experimental results show that the XGBoost model achieves the highest predictive performance with an accuracy of 89% and AUC of 0.92. The proposed system assists healthcare administrators in better bed allocation and resource planning.

Keywords: Healthcare decision support systems, explainable artificial intelligence, machine learning, XGBOOST.

Paper ID: ICA6NT 593

SMART PARKING MANAGEMENT SYSTEM USING LORA TECHNOLOGY

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ABSTRACT

This work presents an IoT-based Smart Parking Management System designed to address traffic congestion and inefficient parking utilization in urban environments. The proposed system employs IR sensors installed in individual parking slots to detect vehicle presence. For reliable communication and wide-area coverage, the system integrates LoRa technology to transmit occupancy data from distributed sensor nodes to a central LoRa gateway. The gateway processes incoming packets and provides immediate, real-time parking availability via a localized LCD interface. Experimental evaluation demonstrates improved parking efficiency and optimized space utilization while maintaining low power consumption and cost-effectiveness. The proposed system supports scalable deployment and serves as a robust framework for intelligent transportation infrastructures.

Paper ID:ICA6NT 594

AI AND IOT ENABLED SMART CLASSROOMS: A CONCEPTUAL FRAMEWORK FOR TRANSFORMING TRADITIONAL EDUCATION SYSTEMS

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ABSTRACT

The continuous advancement of digital technologies has significantly influenced the transformation of modern education systems. However, conventional classrooms often struggle with challenges such as limited student engagement, one-size-fits-all teaching, and delayed feedback. This paper proposes a conceptual framework for AI and IoT enabled smart classrooms that integrates artificial intelligence and Internet of Things devices to create adaptive and interactive learning environments. The framework leverages AI algorithms to provide personalized learning paths, while IoT sensors and devices enable real-time monitoring of student engagement and classroom conditions. Additionally, a feedback and analytics module facilitates timely interventions by teachers and administrators. The proposed framework aims to improve learning outcomes, increase student participation, and optimize classroom management, offering a scalable model for modern education systems. The paper also discusses potential challenges and future directions for implementing AI-driven smart classrooms.

Paper ID:ICA6NT 595

AI-DRIVEN PREDICTIVE IRRIGATION SYSTEM USING IOT SENSOR DATA AND MACHINE LEARNING TECHNIQUES

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ABSTRACT

Efficient water management is a major challenge in modern agriculture due to climate variability, increasing water scarcity, and improper irrigation practices. Traditional IoT-based irrigation systems typically operate using fixed soil moisture thresholds, which often result in over-irrigation or under-irrigation because they fail to consider dynamic environmental conditions. Such limitations reduce water-use efficiency and may negatively affect crop productivity.

This paper proposes an **AI-driven predictive irrigation system** that integrates Internet of Things (IoT) sensors with machine learning techniques to dynamically forecast irrigation requirements. Environmental parameters such as soil moisture, temperature, and humidity are collected through distributed IoT sensor nodes deployed in the agricultural field. The collected data is transmitted via a wireless communication module to a cloud-based platform where it is stored and processed for further analysis.

Machine learning regression models are trained using historical and real-time sensor data to predict the optimal irrigation requirement for crops. The predictive model enables the system to determine irrigation needs more accurately compared to conventional rule-based systems. Based on the predicted values, the automated irrigation system activates the water pump only when necessary, thereby reducing unnecessary water consumption.

Paper ID: ICA6NT 596

NERUL NETWORK BASED ANDROID APP FOR FISH IDENTIFICATION AND VOLUME ESTIMATION USING FLUTTER AND FIREBASE

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ABSTRACT

This research paper presents the development of a network-based Android application for fish identification and volume estimation. The system is designed using Flutter for frontend development and Firebase for backend services including authentication, database, and cloud storage. The application allows users to capture fish images, identify fish species using machine learning models, and estimate fish volume automatically. The proposed system helps fishermen, fish vendors, and marine researchers by providing accurate fish identification and approximate volume calculation in real-time. The system architecture follows a client-server model and ensures fast performance, scalability, and reliability.

Paper ID: ICA6NT 597

AUTOMATIC HOSPITAL SANITIZING ROBOT

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ABSTRACT

Maintaining strict hygiene standards in hospitals and healthcare facilities is essential to reduce the spread of infectious diseases and ensure patient safety. Manual sanitization practices are often time-consuming, inconsistent, and expose cleaning personnel to harmful pathogens and chemical disinfectants. To address these challenges, this paper presents an Automatic Hospital Sanitizing Robot, an autonomous and IoT-enabled system designed for contactless and consistent disinfection of indoor healthcare environments.

The robot is developed using an ESP32 microcontroller and employs IR sensors for edge detection and ultrasonic sensors (HC-SR04) for obstacle avoidance, enabling safe autonomous navigation. A relay-controlled sanitizing spray unit disperses disinfectant during movement, while an L298N motor driver controls DC motors mounted on a wheeled chassis. The built-in Wi-Fi capability of the ESP32 supports optional remote monitoring and control through a mobile or web interface, along with manual override using onboard push buttons.

The proposed system reduces human intervention, improves operational safety, and provides a scalable and cost-effective solution for automated sanitization in hospitals, clinics, and public healthcare facilities.

Paper ID: ICA6NT 598

DESIGN OF A POWER-EFFICIENT MULTIPLIER USING BOOTH ENCODING FOR DL SYSTEMS

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ABSTRACT

Deep learning-based application requirements include significant multiplication operations, making arithmetic circuits the primary contributor to the power consumption and processing delay in the current hardware platforms. To solve this problem, this project introduces the Booth Encoding Based Energy Efficient Multiplier, which can provide optimal performance for deep learning-based applications. Using the Modified Booth Encoding method, the proposed architecture can minimize the partial products generated during the multiplication process. As a result, the proposed Booth Encoding Based Energy Efficient Multiplier can minimize the switching activities, hardware complexity, and consequently the power consumption. The proposed multiplier includes an efficient partial product reduction network using the compressor tree method to improve the performance and provide higher accuracy during the multiplication process. Based on the results obtained during the simulation and synthesis process, the proposed Booth Encoding Based Energy Efficient Multiplier can provide the required performance by minimizing the power consumption and propagation delay during the multiplication process. As a result, the proposed Booth Encoding Based Energy Efficient Multiplier can provide the required performance for the next-generation deep learning hardware platforms.

Paper ID: ICA6NT 599

INTELLIGENT TRAFFIC MANAGEMENT AND ALERT SYSTEM USING CCTV AND OPENCV

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ABSTRACT

Efficient urban traffic oversight remains a significant hurdle in the development of modern smart cities. Traditional management methods, which depend on manual observation of surveillance footage by personnel, are often plagued by delays, high manpower requirements, and human error. To address these limitations, this paper introduces an Intelligent Traffic Management and Alert System that leverages advanced computer vision and deep learning techniques. By utilizing real-time CCTV video streams, the system employs YOLOv8 and Convolutional Neural Network (CNN) architectures to identify vehicles and pedestrians with high precision. The proposed architecture includes a comprehensive preprocessing stage featuring frame skipping and color normalization to enhance computational efficiency. Through the implementation of Region of Interest (ROI) mapping, the system focuses on critical zones to detect specific infractions, including lane cutting, red-light violations, and the absence of helmets. Once a violation is confirmed, the system automatically logs the incident—including an evidence image and timestamp—into a SQLite database and triggers immediate email notifications to authorities. Furthermore, a web-based dashboard developed using the Flask framework provides historical analytics and real-time monitoring capabilities. This integrated approach minimizes the need for continuous human supervision while significantly enhancing road safety and maintaining traffic discipline through automated, reliable surveillance.

Paper ID: ICA6NT 601

REAL TIME VEHICLE HEALTH MONITORING SYSTEM AND PREDICTIVE MAINTENANCE USING AWS IOT ANALYTICS

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ABSTRACT

The increasing demand for intelligent transportation systems has accelerated the development of digital solutions for efficient vehicle health monitoring and maintenance. In conventional fleet operations, vehicle health data are often fragmented across service centers and diagnostic tools, leading to delayed fault detection, increased downtime, and higher maintenance costs. This paper presents a Real-Time Vehicle Health Monitoring and Predictive Maintenance System utilizing AWS IoT Analytics for data acquisition, processing, and analysis. The system integrates sensors such as temperature, vibration, and OBD-II data modules with an ESP32 microcontroller to collect real-time vehicle parameters. The acquired data are transmitted securely to AWS IoT Core and analyzed through AWS IoT Analytics and Machine Learning models to predict potential faults and maintenance needs.

Paper ID:ICA6NT 602

An Application of Machine Learning and Deep Learning for Integrated Audio-Visual Emotion Recognition System

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ABSTRACT

Human computer interaction systems become more intuitive and responsive when they can accurately detect and interpret human emotions. The ability to identify emotions using computer algorithms holds ground breaking possibilities across multiple industries such as entertainment, interface design and mental health treatment. The project presents an emotion recognition system that combines visual and auditory data processing to create complete emotional profiles and enhance human machine communication. Individuals' emotional states can be extensively understood through visual signals especially facial expressions. The tone and intonation in voice serve as essential auditory signals delivering critical contextual cues needed for precise emotional interpretation .Single-modality input systems used by traditional methods frequently result in incorrect emotion interpretation and diminished sensitivity to subtle emotional cues. Our system merges visual and auditory input channels to surpass existing analytical constraints and deliver precise emotion assessments.

Keywords— Artificial Intelligence, Machine Learning, Deep Learning, Audio-Visual Emotional Data.

Paper ID:ICA6NT 605

AI-Powered Pest Control Device

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ABSTRACT

Pest infection remains a major challenge in agriculture, leading to significant crop damage and economic loss. Conventional pest control techniques, including chemical pesticides and static ultrasonic repellents, suffer from environmental concerns and non-selective operation. This paper presents an AI-Powered Pest Control Device that integrates image processing with embedded directional ultrasonic actuation for intelligent and selective pest control.

The proposed system combines hardware and software modules for real-time monitoring and automated response. A camera module continuously captures images or video of insects entering the monitored region. Using image processing techniques, the captured data is analyzed to classify whether the detected insect is harmful or non-harmful. The classification module operates as a lightweight edge-based decision system. Only when a harmful pest is identified does the system activate the repellent mechanism.

The hardware subsystem is built around an ESP32 microcontroller, which performs sensor coordination, decision execution, and actuator control. A servo-driven mechanism enables directional alignment of an ultrasonic transducer toward the detected pest location, inspired by smart antenna beam-steering concepts. This targeted ultrasonic emission enhances energy efficiency compared to conventional omnidirectional systems.

By combining computer vision-based pest validation with directional ultrasonic deterrence, the proposed system reduces false activation, minimizes power consumption, and eliminates the need for harmful chemicals. The developed prototype demonstrates a scalable, low-cost, and eco-friendly solution for precision agriculture and smart farming applications.

Wi-Sense: A Lightweight Deep Learning Framework for Device-Free Intrusion Detection and Occupancy Estimation Using Wi-Fi CSI with ESP32 Edge Deployment

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ABSTRACT

The increasing demand for privacy-preserving smart surveillance systems has driven research toward device free sensing approaches that leverage existing wireless infrastructure. Traditional camera-based intrusion detection systems raise privacy concerns and require controlled lighting conditions, while Passive Infrared (PIR) sensors suffer from limited spatial sensitivity and high false alarm rates. This paper presents Wi Sense, a lightweight deep learning framework for device-free physical intrusion detection and multi-class occupancy estimation using Wi-Fi Channel State Information (CSI). The proposed system captures fine-grained CSI amplitude variations using an ESP32-based CSI receiver and processes the data through a structured signal preprocessing pipeline including outlier removal, smoothing, normalization, and sliding window segmentation. A compact one-dimensional Convolutional Neural Network (1D CNN) is designed to extract spatial correlations across subcarriers and classify occupancy levels ranging from 0 to 5 persons. Binary intrusion detection is derived from occupancy classification results. Experimental evaluation in a realistic furnished indoor environment demonstrates 96.8% intrusion detection accuracy and 92.4% occupancy estimation accuracy. Furthermore, the architecture is optimized for TinyML deployment, enabling standalone inference and alert transmission directly from the ESP32 microcontroller without reliance on external computation. The results validate the feasibility of scalable, low-cost, and privacy-aware smart building security using commodity Wi-Fi infrastructure.

Index Terms – Wi-Fi CSI, Device-Free Sensing, Intrusion Detection, Occupancy Estimation, ESP32, TinyML, Edge AI, 1D CNN

Paper ID:ICA6NT 607

AI-Based Smart Learning Systems for Modern Education

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ABSTRACT

Artificial Intelligence (AI) is rapidly transforming modern education by enabling the development of intelligent and adaptive learning systems. AI-based smart learning systems integrate technologies such as machine learning, natural language processing, and learning analytics to create personalized and interactive educational environments. These systems analyze students' learning behavior, academic performance, and engagement patterns to provide customized learning paths and real-time feedback. As a result, students can learn at their own pace while teachers receive valuable insights to improve teaching strategies. AI tools such as intelligent tutoring systems, automated assessment, and predictive analytics enhance the overall efficiency of the learning process. Furthermore, smart learning platforms support remote and digital education, making knowledge more accessible and flexible. Despite challenges related to data privacy, ethical concerns, and technological infrastructure, AI-driven educational systems have significant potential to improve learning outcomes and support innovative teaching methods. Therefore, integrating AI into education can play a crucial role in shaping the future of modern learning environments.

Keywords: Artificial Intelligence, Smart Learning Systems, Machine Learning, Personalized Learning, Educational Technology

Paper ID:ICA6NT 610

Underground Water Pipeline Automation Using IoT

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ABSTRACT

This paper presents an IoT-based automation system for efficient monitoring and control of underground water pipelines in residential and municipal areas. The proposed system is designed to assist municipal corporations in automating manual valve operations, which are often delayed due to human unavailability. Using an ESP32 microcontroller integrated with flow, pressure, and water quality sensors, the system continuously monitors parameters such as flow rate, pressure variation, and water potability. Real-time data is transmitted to a cloud dashboard and mobile application for visualization and management. The integration of a Real-Time Clock (RTC) module enables automated valve scheduling, ensuring timely water distribution without manual intervention. Additionally, the system alerts authorities in case of poor water quality or abnormal flow conditions, enabling prompt maintenance action. Experimental results demonstrate that the developed system provides a reliable, scalable, and cost-effective solution for intelligent water management, improving service efficiency and supporting sustainable urban water infrastructure.

Paper ID: ICA6NT 612

Loan Utilization Tracking Via Mobile App Using Flutter and Firebase

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ABSTRACT

The Loan Utilization Tracking via Mobile App using Flutter and Firebase is a mobile-based application designed to monitor and manage the usage of loan amounts in a simple and efficient way. The system integrates modules such as loan record management, expense tracking, repayment monitoring, user authentication, and report generation into a single centralized platform.

Developed using Flutter for frontend development and Firebase for backend services and database management, the system ensures secure data storage, real-time data synchronization, and role-based access control. It reduces manual record keeping, minimizes financial mismanagement, improves transparency, and enhances financial planning for users. Overall, the application provides a reliable and scalable solution for effective loan utilization tracking.

Keywords: Loan Utilization Tracking, Flutter, Firebase, Mobile Application, Real-Time Database, Role Based Access.

Paper ID: ICA6NT 613

Smart Medicine Assistant With IOT

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ABSTRACT

In today's fast-paced life, patients often forget to take their prescribed medicines on time, leading to serious health consequences. The Smart Medicine Assistant is an IoT-based system designed to automate the process of medicine reminders and dispensing. The system integrates an ESP32 microcontroller with a DS3231 Real-Time Clock (RTC), OLED display, buzzer, RGB LED, and servo motor for real-time scheduling, notification, and pill dispensing.

An Android application connected through Firebase Realtime Database allows users to set medicine schedules and monitor intake history remotely. The proposed design provides a reliable, low-cost, and user-friendly solution to improve medication adherence among patients, especially for elderly and chronically ill individuals.

Keywords — IoT, ESP32, Medicine Dispenser, Firebase, RTC, Smart Healthcare, Automation.

Paper ID: ICA6NT 618

SMART ACADEMIC ACTIVITY AND ATTENDANCE PORTAL USING PYTHON

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ABSTRACT

The Smart Academic Activity and Attendance Portal is a web-based digital platform developed to automate attendance tracking and academic performance monitoring within educational institutions. Traditional attendance methods rely heavily on manual registersbased systems, which are often time-consuming, inaccurate, and vulnerable to manipulation.

The proposed system integrates QR code-based attendance marking with a centralized MySQL database to ensure structured, secure, and real-time data management. The backend is implemented using Python, which handles authentication, session management, attendance validation, and analytics processing.

The portal provides dashboards for administrators and faculty members to monitor attendance percentages, identify students at academic risk, and generate structured reports. By combining automation, analytics, and secure database integration, the system enhances operational efficiency, transparency, and institutional decision-making capabilities.

Paper ID: ICA6NT 619

PRIVACY PRESERVING FEDERATED LEARNING FOR NETWORK AND TRANSACTION ANAMOLY DETECTION

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ABSTRACT

Privacy-preserving anomaly detection is essential due to the rapid growth of sensitive data in cybersecurity, banking, and IoT systems. Traditional centralized methods collect data in a single server, which creates risks such as data breaches and unauthorized access. To address this, the proposed system uses federated learning, where multiple clients train models locally on their own data and share only encrypted model updates instead of raw data. The framework combines Autoencoders to detect abnormal patterns and LSTM networks to capture temporal patterns in time-series data. Secure aggregation and encryption protect model updates during communication, ensuring data privacy. The decentralized architecture improves scalability, reliability, and fault tolerance while allowing data owners to maintain full control over their datasets. This approach enables secure and privacy-aware anomaly detection for applications such as network intrusion detection, financial fraud detection, and IoT monitoring systems

Paper ID:ICA6NT 620

CONTINUOUS MULTIMODAL AUTHENTICATION USING WI-FI PROXIMITY, FILTERED AMBIENT AUDIO, AND MOUSE DYNAMICS WITH RELIABILITY- WEIGHTED SOFTMAX FUSION

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ABSTRACT

Systems that continuously verify a user's identity by combining behavioural and environmental signals offer a robust way to strengthen security without burdening the user. In this work we introduce a four-stream authentication framework that merges Wi-Fi signal strengths from both a laptop and a smartphone, ambient sound pressure levels, and mouse movement characteristics. For each stream a match score is derived by comparing live readings against an enrolled user template. Additionally, a reliability value is assigned per stream based on indicators of signal quality such as signal strength, data freshness, or activity level. These reliability estimates are then used to weigh the stream contributions through a softmax function with stream-specific scaling factors. The combined score is temporally smoothed using an exponential moving average, and an adaptive threshold adjusts according to overall data quality. We examine nine different combination strategies, including our proposed Softmax-R technique, on a dataset gathered from five participants under both genuine and impostor conditions. Experimental results show that Softmax-R achieves an Equal Error Rate (EER) of 3.2%, surpassing simple averaging (EER 7.8%), the product rule (EER 9.4%), and Dempster-Shafer fusion (EER 4.5%). An ablation study confirms that all four streams contribute positively, with the pairing of both Wi-Fi sources together with mouse dynamics being the most informative. The complete system is deployed as a live dashboard together with an Android companion application, illustrating its real-world feasibility.

Paper ID:ICA6NT 622

QUANTUM INTELLIGENCE FOR UAV NETWORKS: FEDERATED LEARNING APPROACHES AND OPTIMIZATION

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ABSTRACT

Drones in sorting land types are used to monitor areas, agriculture, monitor disasters, or monitor nature changes. The application of drones in sorting land types is done to monitor an area, agriculture, observe disasters, or observe changes in nature. The old AI systems do pool information in one place, however - it consumes more power, has poorer privacy, and suffers high link loads; not convenient with drones that have low battery capacities. Federated Learning is an algorithm enabling the drones to acquire intelligence through collaboration without real images and minimizes leakage and traffic. On any case, it affects the frequency of FL which is slow in pushing updates, gets lost by the uneven distribution of data and it consumes chewing equipment resources. This can be overcome with newer quantum technology - Quantum Federated Learning quantum style quantum brains and smarter math tricks in group learning settings. QFL boosts the appearance of the features, elevates tuning speed, better results and reduces the degree of data exchange, which is optimal in big drone networks that save energy. We take a more detailed look at the way drones inspect the land, different architectures of FL systems, the basics of quantum computing, and novel Q7L applications that arise. Such applications as more overhead observation, agriculture, wildfire control, emergency management, or urban data streams are also followed using energy-sensitive tweaks. And last but not least, we refer to what still stands in the way of QFL and the path that any further research must be led through in order to help it to be functioning in the real world.

Paper ID:ICA6NT 623

HIGH PERFORMANCE WALLACE TREE MULTIPLIER USING APPROXIMATE ADDER

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ABSTRACT

The efficient Wallace tree multiplier uses an approximate adder instead of full-adder as it increases speed, lowers power usage, and needs less hardware. This design swaps the traditional full adders with approximate adders during the reduction phase, which makes the calculations simpler while still small errors are allowed in the results. By selecting the approximate adder very carefully so the errors remain small and output quality is not affected. This design is done using Cadence, a professional VLSI design software, which results in high speed improvement, Lower power consumption and Simpler Hardware.

Keywords: Wallace Tree Multiplier, Approximate Adder, Energy-Efficient VLSI, Fast Arithmetic Circuits, Power and Area Optimization, Cadence Design Tools.

Paper ID:ICA6NT 627

HONEYPOTS AS A PROACTIVE DEFENSE MECHANISM IN MODERN CYBERSECURITY

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ABSTRACT

Honeypots have become an important tool for improving modern cybersecurity by helping organizations better detect, analyze, and understand cyber threats. This study explores how honeypots can be effectively integrated with existing security technologies such as Intrusion Detection and Prevention Systems (IDPS), firewalls, Security Information and Event Management (SIEM) systems, and Security Orchestration, Automation, and Response (SOAR) platforms. The research follows a systematic methodology that combines a comprehensive literature review with case-based analysis to evaluate current approaches and identify opportunities for improvement. Based on these findings, the study proposes a framework that enhances honeypot capabilities using artificial intelligence (AI) and machine learning (ML). By incorporating AI and ML techniques, honeypots can generate dynamic threat intelligence, support predictive analysis, and enable more adaptive responses to evolving cyber threats. The results highlight that AI-enabled honeypot integration can improve threat detection accuracy, reduce resource overhead, and provide valuable insights into attacker tactics, techniques, and procedures (TTPs). These insights can help security teams better understand adversarial behavior and strengthen overall cybersecurity defense strategies.

Paper ID:ICA6NT 630

Smart Dine-In: Contactless Restaurant Management System

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ABSTRACT

The rapid growth of online food delivery and restaurant discovery platforms has increased the need for intelligent and personalized recommendation systems. Traditional approaches primarily rely on collaborative filtering and user ratings, often neglecting contextual attributes such as sentiment in reviews, geospatial proximity, and semantic restaurant relationships. This paper presents Smart Dine, a hybrid context-aware restaurant recommendation system integrating collaborative filtering, content-based filtering, sentiment analysis using Natural Language Processing (NLP), and geolocation-aware ranking. Inspired by recent knowledge graph-driven food recommendation frameworks [1], the proposed system enhances restaurant representation using semantic feature modeling and integrates sentiment polarity scores into the ranking function. The model is deployed as a full-stack web application enabling real-time predictions and visual insights. Experimental evaluation demonstrates improved Precision@K and Recall@K compared to standalone collaborative filtering baselines. The proposed framework offers an interpretable, scalable, and AI-driven solution for intelligent dining assistance.

Index Terms – Restaurant Recommendation, Hybrid Recommender System, Machine Learning, Sentiment Analysis, Context-Aware Systems, Knowledge Graph, NLP.

Paper ID:ICA6NT 631

DEEP LEARNING BASED PARCEL DAMAGE CLASSIFICATION FOR SHIPMENT QUALITY EVALUATION

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ABSTRACT

Ensuring parcel quality is a crucial requirement in today's shipping and logistics industries, as fast and accurate detection of package damage plays a major role in minimizing financial losses and improving customer satisfaction. This work proposes a novel package damage classification framework based on computer vision and deep learning (DL) techniques. In this study, a hybrid model combining a Convolutional Neural Network (CNN) and a Support Vector Machine (SVM) is employed to effectively classify multiple parcel defects, including scratches, deformation, and cracks. This approach provides a reliable assessment of shipment conditions and enhances inspection accuracy. The proposed system primarily focuses on automated parcel evaluation in logistics environments, addressing the increasing demand for dependable and intelligent inspection technologies. Several key quantitative performance metrics are systematically utilized to evaluate the efficiency of the developed DL-based model in accurately identifying, classifying, and categorizing various package damages. Experimental results demonstrate an impressive classification accuracy of 98.8%, confirming the model's reliability and suitability for real-world deployment. Furthermore, the outcomes highlight significant benefits for shippers, logistics service providers, and e-commerce stakeholders by reducing cargo losses, improving quality control processes, and enhancing customer satisfaction. Overall, the integration of computer vision and deep learning techniques provides a powerful solution for automated parcel damage detection, contributing effectively to the logistics and shipping domain. This

methodology is designed to streamline shipment quality assessment across the supply chain, offering a scalable and efficient solution that improves operational performance and ensures superior service delivery.

Paper ID:ICA6NT 633

INDIC SPEECH RECOGNITION FOR MULTILINGUAL AI PERSONAL ASSISTANTS: FROM ACOUSTIC MODELING TO AUTONOMOUS AGENTIC FRAMEWORKS

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ABSTRACT

The convergence of speech recognition technology and large language models has catalysed a fundamental transformation in how AI personal assistants serve diverse linguistic communities. This paper surveys the landscape of Indic speech recognition and its integration into autonomous, multilingual AI assistant frameworks, examining how advances in acoustic modeling, dataset construction, and agentic orchestration are collectively enabling voice-first digital access for India's linguistically diverse population. We trace the architectural evolution from statistical Hidden Markov Model baselines through self-supervised foundation models such as IndicWav2Vec and IndicConformer, and audit the benchmarking ecosystem – spanning IndicSUPERB, Vistaar, BhasaAnuvaad, and Nirantar – that underpins rigorous evaluation across India's twenty-two scheduled languages. Central to this survey is the challenge of deploying these capabilities within agentic frameworks, where spoken natural language must be parsed, grounded in context, and translated into orchestrated tool calls across real-world APIs. We analyze the sociolinguistic complexities of code-switching, dialectal variation, and low-literacy interaction dynamics that define authentic Indian voice assistant usage, and examine domain-specific deployments in agriculture, healthcare, and financial services.

Paper ID:ICA6NT 635

SubGEN AI: Hardware-Aware AI Subtitle Generator with MFCC-Based Correction Validation and Embedding Self-Improvement for Low-Resource Indic Languages

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ABSTRACT

Automated subtitle generation systems suffer from high Word Error Rate (WER) in noisy real-world conditions and demonstrate particularly poor performance on low-resource Indic languages such as Tamil, Telugu, Malayalam, and Hindi. We present SubGEN AI, a novel hardware-software co-design framework that integrates an ESP32 microcontroller as a dedicated Digital Signal Processing co-processor for real-time MFCC audio fingerprinting. The ESP32 implements a 512-point radix-2 FFT, 26-band mel filterbank, and DCT-II entirely in embedded C firmware without any DSP library, producing compact 24-value audio fingerprints communicated over USB serial. A Signal-Informed Quality Control module fuses Faster-Whisper ASR confidence with hardware-estimated SNR to generate RED/GREEN segment labels, reducing post-editing time by 61%. A privacy-preserving self-improvement loop stores hardware-validated user corrections as MFCC fingerprint-text pairs in a local SQLite database and applies them at inference time via nearest-neighbour cosine similarity lookup, requiring no GPU, no cloud, and no retraining. Experiments on 15 test videos demonstrate 91% correction validation accuracy, 90% QC classification accuracy, and 23-26% relative WER reduction for Tamil and Telugu domain vocabulary after 30 minutes of correction data. SubGEN AI provides a scalable, offline-first, accessible subtitle solution for the 63 million hearing-impaired individuals in India.

Index Terms—Automatic Speech Recognition, MFCC Audio Fingerprinting, ESP32 Embedded DSP, Indic Languages, Signal-Informed Quality Control, Embedding Correction, Whisper, Hardware-Software Co-Design.

Paper ID:ICA6NT 636

Generative AI-Based Adaptive Threat Detection in Multi-Cloud Infrastructure

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ABSTRACT

This paper proposes a proactive approach to cloud cybersecurity threat detection that leverages generative AI. To this end, the proposed framework integrates generative models, including GANs and VAEs, with cloud-native security services to model attacks and detect vulnerabilities in advance.

The study explores how generative AI can be used to prevent, model, and mitigate cyber threats before they are exploited, thereby overcoming limitations of conventional security measures. It emphasizes a timely and context-aware proactive strategy rather than a reactive one, while also addressing resource constraints and key challenges in modern cybersecurity. The proposed solution highlights a forward-looking approach to strengthening cloud security in the evolving threat landscape.

Keywords: Generative AI, Cybersecurity, Cloud Environments, Threat Detection, GANs, Anomaly Detection

Paper ID:ICA6NT 637

Real-Time Water Quality Monitoring System

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ABSTRACT

Water quality monitoring is a critical requirement for ensuring safe water for drinking, agriculture, and industrial applications. Rapid industrialization, urban runoff, and agricultural activities have significantly increased water pollution, making continuous and real-time monitoring essential. Traditional water quality testing methods are laboratory-based, time-consuming, and unable to provide instant results, which limits timely decision-making. The major challenge in water quality assessment lies in the lack of low-cost, real-time, and remote monitoring systems capable of measuring multiple parameters simultaneously. Existing systems often focus on limited parameters, reducing efficiency and scalability. Hence, there is a need for an automated and reliable solution that can continuously monitor water quality and provide instant access to data.

This paper presents a **Real-Time Water Quality Monitoring System** based on the ESP32 microcontroller. The system measures important water quality parameters such as temperature, pH, turbidity, and Total Dissolved Solids (TDS) using dedicated sensors. The collected data is processed by the ESP32 and transmitted wirelessly using Wi-Fi technology to a web dashboard for real-time monitoring.

The proposed system provides a low-cost, portable, and efficient solution for continuous water quality monitoring. Experimental results show that the system provides reliable and consistent readings under different water conditions. The system can be used in domestic water supply systems, environmental monitoring, and industrial water management.

Keywords: Real-Time Water Quality Monitoring, ESP32 Microcontroller, pH Sensor, Total Dissolved Solids (TDS), Turbidity Sensor, Temperature Sensor.

Paper ID:ICA6NT 640

AI-BASED MULTIMODAL MOCK INTERVIEW AND COMMUNICATION SKILL ASSESSMENT SYSTEM

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ABSTRACT

Effective interview performance requires not only accurate answers but also clear communication, confident body language, and emotional composure. Existing interview preparation tools typically focus on a single aspect, such as speech or facial expressions, and rarely provide integrated, real-time feedback across modalities (types of communication, such as voice and posture). This paper presents a browser-based multimodal (involving multiple types of input) mock interview system that unifies posture, speech, and facial expression analysis within three tailored practice modules: open speaking, technical interviews, and resume-based scenarios. The system utilises Google Teachable Machine (an online tool to train machine learning models) for body posture and speech assessment, a convolutional neural network (CNN, a type of AI model good at recognizing patterns) trained on the FER-2013 dataset (a collection of facial images labeled with emotions) for facial emotion recognition, and Mistral AI (an AI-based answer evaluator) for evaluation of technical answers. All analysis is performed locally in the browser using React (a JavaScript framework for building interfaces) and TensorFlow.js (a JavaScript library for running AI models), ensuring user privacy and rapid feedback. Quantitative results from user testing demonstrate that the system provides comprehensive, actionable insights, leading to measurable improvements in user confidence and performance across diverse interview contexts.

Keywords:Mock Interview, Communication Assessment, Multimodal AI, Real-time Feedback, Behavioural Analysis, AI Coaching, Interview Simulation, Teachable Machine, Resume-based Interview

Paper ID:ICA6NT 643

Integrated VOC and Biosensor-Based System for Plant Stress Detection and Agricultural Recommendations

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ABSTRACT

Agriculture is vital for maintaining global food security; however, environmental and biological stressors like drought, pathogen attacks, nutrient shortages, and soil pollution often impact crop yield. Traditional methods of crop monitoring depend largely on visible indicators of plant distress like chlorosis, leaf color changes, and wilting, which tend to manifest only after considerable physiological harm has taken place. This postponement frequently hinders prompt intervention and results in significant yield reductions. Consequently, an increasing demand exists for intelligent systems that can identify early biochemical indicators of plant stress prior to the emergence of visible symptoms. This research introduces a system for crop stress fingerprinting based on Artificial Intelligence, which combines MQ-135 volatile organic compound (VOC) sensors, aptamer-based biosensors, and an ESP32 microcontroller to monitor plant health in real time. Stressed plants release particular VOCs and biochemical markers like salicylic acid and abscisic acid, acting as early signs of physiological changes in plants. The gathered sensor data is analyzed with machine learning models that examine stress patterns and categorize crop stress situations. According to the classification outcomes, the system offers smart agricultural suggestions such as improved biofertilizer compositions and phytoremediation techniques for managing soil contamination. The suggested framework offers a scalable and economical decision-support system for precision agriculture, facilitating early stress identification, enhanced soil health management, and sustainable crop production

Keywords: Aptamer Biosensor, Artificial Intelligence, Crop Stress Detection, Phytoremediation, Precision Agriculture, VOC Sensor.

Paper ID:ICA6NT 644

MITIGATING TOXICITY IN TEXT VIA LARGE PRE-TRAINED NEURAL ARCHITECTURES

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ABSTRACT

We present two novel unsupervised methods for eliminating toxicity in text. Our first method combines two recent ideas: (1) guidance of the generation process with small style-conditional language models and (2) use of paraphrasing models to perform style transfer. We use a well performing paraphraser guided by style trained language models to keep the text content and remove toxicity. Our second method uses BERT to replace toxic words with their non-offensive synonyms. We make the method more flexible by enabling BERT to replace mask tokens with a variable number of words. Finally, we present the first large scale comparative study of style transfer models on the task of toxicity removal. We compare our models with a number of methods for style transfer. The models are evaluated in a reference-free way using a combination of unsupervised style transfer metrics. Both methods we suggest yield new SOTA results.

Paper ID:ICA6NT 645

A COMPREHENSIVE SURVEY ON THE EVOLUTION OF FAKE NEWS DETECTION: FROM TEXT-BASED MODELS TO MULTIMODAL METHODS

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ABSTRACT

The emergence of the social media has brought major consequences to society, politics and economy because the proliferation of misinformation and fake news has accelerated by a large margin. The conventional fake news detection algorithms were mostly based on textual classification that applied machine learning and natural language processing methods. Nevertheless, contemporary misinformation systems usually incorporate the use of multimedia, including pictures and videos, to enhance the credibility and acceptability of the information by the people. Consequently, this is pushing the researchers to multimodal fake news detection approaches that also involve the input of several modalities. The paper provides an overview of the development of fake news detection methods, starting with primitive text-based methods up to sophisticated multimodal deep learning systems. The questionnaire examines recent advancements in the field of attention-based models, multimodal fusion networks, knowledge-based systems, and the graph neural network frameworks. When contributing to it, the popular datasets and performance measures in the field of fake news detection are examined to provide a systematic comparison of the existing approaches. The survey also mentions such research challenges as multimodal inconsistency, limited availability of datasets, explainability, and limitations of real-time detection. Lastly, the future research directions are mentioned, and they are knowledge grounding, multimodal transformers, and incorporating large language models into a better misinformation detection system.

Paper ID:ICA6NT 646

VOICE CONTROLLED PROSTHETIC ARM

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ABSTRACT

The Voice Controlled Prosthetic Arm represents a remarkable advancement in rehabilitation technology. It bridges the gap between human intention and mechanical action through voice recognition. This innovation is particularly beneficial for individuals with upper limb amputations, as it restores partial functionality and enhances independence in daily activities. The system's core components include a microphone for capturing commands, a speech recognition module that interprets the spoken input, and an Arduino microcontroller that processes the data and controls servo motors to perform specific movements. Each servo motor corresponds to different joints of the arm, such as the elbow, wrist, or fingers, enabling coordinated and smooth motion. One of the significant advantages of this system is its simplicity and affordability. Traditional prosthetic arms that use neural or myoelectric control are often complex and expensive, making them inaccessible to many users. In contrast, the Arduino-based design offers a low-cost alternative that can be built, programmed, and maintained easily using off-the-shelf components. The entire system is lightweight and energy-efficient, powered by a rechargeable battery that ensures portability and long operational hours. Moreover, the modular design allows users or technicians to replace or upgrade individual components without altering the whole system.

Paper ID:ICA6NT 647

IOT BASED TRAFFIC SIGNAL MONITORING SYSTEM

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ABSTRACT

The number of traffic accidents in contemporary cities has risen to an unpredictable level. Accidental deaths of people should be prevented. The main factors causing delays for ambulances, fire engines, and VIP vehicles are traffic congestion and tidal flow. We implement a program known as ITLS (Intelligent Traffic Light System) to prevent fatalities from accidents. This plan's primary goal is to minimize traffic congestion-related delays by facilitating the timely arrival of emergency vehicles, such as ambulances, at hospitals. The plan calls for the implementation of ITLS, which would mechanically manage the traffic lights in the path of VIP vehicles, fire engines, and ambulances. The ambulance is managed by the control unit, which provides a suitable route and regulates the traffic light based on the ambulance's location, ensuring a safe arrival at the hospital.

Paper ID:ICA6NT 649

SHOPMIND AN AUTONOMOUS E-COMMERCE AI AGENT FOR SMART SHOPPING & SELLER COORDINATION

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ABSTRACT

Online shopping has become a common method for purchasing products because of its convenience and easy access. However, most existing e commerce systems use fixed pricing and provide very limited interaction between buyers and sellers. This paper presents Shop Mind, an artificial intelligence based e commerce system that supports intelligent product search and automatic price negotiation. The system uses natural language processing to understand user requirements and machine learning to support decision making. A dual agent model is used to represent both users and sellers. The proposed system improves user experience, reduces effort, and helps sellers make better pricing decisions.

Paper ID:ICA6NT 650

BHARATANATYAM STEP RECOGNITION USING AUDIO-TO-TEXT PROCESSING FOR INTELLIGENT DANCE LEARNING

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ABSTRACT

Bharatanatyam is a classical Indian dance form characterized by structured rhythmic patterns and synchronized movements called adavus. These movements are guided by rhythmic syllables known as sollukattu, which provide timing and motion cues for dancers. Traditional learning requires direct supervision from experienced instructors, limiting accessibility for remote learners. This paper proposes an intelligent Bharatanatyam step recognition framework that converts rhythmic audio recordings into textual syllables using Automatic Speech Recognition (ASR) and maps them to corresponding dance steps using similarity-based pattern matching. The system integrates audio preprocessing, acoustic feature extraction, ASR-based transcription, text similarity analysis, and Dynamic Time Warping (DTW) for robust rhythmic alignment. Experimental evaluation demonstrates that the hybrid recognition approach achieves approximately 89% recognition accuracy for common adavu patterns. The proposed framework provides a foundation for AI-assisted dance learning systems capable of supporting remote practice and preserving traditional Bharatanatyam knowledge.

Paper ID:ICA6NT 652

TO PARTIALLY STATIC HIGH FREQUENCY 18T HYBRID TOPOLOGICAL FLIP - FLOP DESIGN FOR LOW POWER APPLICATION

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ABSTRACT

This paper is based on modern chip design where efficiency, speed, and compact size are all required. This paper on a "partially static high-frequency 18-transistor (18T) hybrid topological flip-flop design for low power applications," then's structured overview applicable information. The hybrid topology combines static CMOS logic, which ensures dependable data retention at the storage node, with dynamic sense factors to minimize transistor count and improve switching speed.

In this paper low power consumption clocking Flip- flop is proposed using only 18 transistor. typically used 24-28 transistor but then we used 18t. Because of low power and reduced size. The flip- flop is digital circuit single bit element which stored data in 0's &1 form. To design this master slave (MS) type architecture, topological hybrid adaptive coupling technique are used.

The minimum transistor are used to make flip- flop which comprises complementary pass transistor logic and static complementary MOS logic because it 18t are important for balancing speed, power and area. The proposed circuit is implemented using cadence virtuso and x compared to five other reported logic, structure of flip-flop. Proposed hybrid logic architecture has showed the highest chance i.e 49.73% it also improved the delay and energy efficiency 20K samples were used in the C to Q Delay Montey carlo simulation. By reducing number of PMOS transistor the total area proposed circuit reduced by a minimum 9.49% in comparison of state of art work. The proposed circuit can work duly within a frequency range upto 1GHz. It is also compared with reported 18t tspc flip-flop.

Paper ID:ICA6NT 653

URAM AI: A Plant-Centric Closed-Loop Framework with Multi-Sensor Fusion for Precision Agriculture

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ABSTRACT

Smart greenhouse systems treat the camera feed and soil sensor network as separate subsystems, creating a dangerous blind spot: nitrogen-deficiency chlorosis and early fungal infection produce visually identical leaf symptoms but need opposite treatments. URAM AI resolves this by fusing an NMS-free YOLOv26 visual classifier with a thirteen-channel ESP32 sensor network reading root-zone ammonia, methane, and hydrogen sulphide alongside NPK macronutrients and canopy spectral reflectance. An AS7341 spectroradiometer derives five vegetation indices – NDVI, PRI, MCARI, SIPI, and ARI – each cycle to discriminate chlorophyll, anthocyanin, and carotenoid changes. A Multi-Modal Stress Index (MMSI) unifies all signals into a 0-to-1 score governing seven closed feedback loops. A stateless Deficiency vs. Disease Discriminator assigns one of four root-cause labels before any actuator fires. Over 195 days on tomato and paddy rice, URAM AI achieved mean F1 = 0.912 across 18 classes, reduced water use by 32%, improved fertiliser efficiency by 28%, and recorded zero safety violations across 6,240 inference cycles ($p < 0.05$).

Keywords: smart agriculture; YOLOv26; MMSI; spectral analysis; vegetation indices; deficiency vs. disease discrimination; IoT; ESP32; closed-loop control; plant disease detection

Paper ID:ICA6NT 654

A Comprehensive Review on Frameworks for Lung Disease Detection and Severity Assessment

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ABSTRACT

Lung diseases including lung cancer, COVID-19, interstitial lung diseases (ILD), pneumonia etc. remains leading causes of global mortality which necessitates rapid and precise diagnostic tools. While deep learning transformed traditional architectures like Computer-Aided Diagnosis (CAD) often faces hurdles with high computational demands, data scarcity, and an inherent lack of interpretability. This review systematically assesses current state-of-the-art advancements in deep learning intended to overcome the clinical obstacles, focusing on hybrid architectures that combines Convolutional Neural Networks with transformers to capture both local features and global context. The analysis examines advances that optimize real-world clinical deployment, including ultra-lightweight networks like GANs to address dataset imbalance and multi-modal data integration with X-ray, CT and histopathological images. The integration of Explainable AI (XAI) which includes Grad-CAM visual heatmaps and Bayesian uncertainty quantification addresses the medical trust issues. The review emphasizes the need for multi-centre validation for effective integration of high-performing diagnostic assistants into clinical workflows at the point of care.

Keywords— Deep learning, hybrid architecture, feature extraction, segmentation, classification, localization, Explainable AI (XAI).

Paper ID:ICA6NT 655

STEEG: A HYBRID SYSTEM FOR HARVESTING NOISE ENERGY AND WIRELESS TRANSMISSION UTILIZING AM/FM/FSK MODULATION

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ABSTRACT

The increasing demand for electricity and the adverse effects of noise pollution necessitate innovative solutions that address both energy generation and environmental sustainability. This paper presents STEEG (Sound To Electrical Energy Generator), a novel system that converts ambient noise into electrical energy using piezoelectric sensors while simultaneously monitoring real-time noise levels through an Arduino-based system. The generated energy is rectified, stored in a lithium-ion battery, and can be utilized for small scale applications. To enhance its functionality, STEEG integrates wireless communication using Analog Modulation (AM/FM) and Digital Modulation (FSK) to transmit real-time noise data to remote monitoring stations. This dual-purpose approach contributes to noise pollution reduction while harnessing renewable energy. Experimental results demonstrate efficient energy harvesting from urban noise sources, real-time noise level transmission via wireless communication, and an effective monitoring system. The study also compares different piezoelectric materials, analyzes conversion efficiency, and evaluates various wireless communication protocols for data transmission.

Paper ID:ICA6NT 656

PREDICTIVE MODELLING OF POLYCYSTIC OVARY SYNDROME BASED ON HORMONAL AND LIFESTYLE FACTORS

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ABSTRACT

Polycystic Ovary Syndrome (PCOS) is a frequently occurring endocrine condition among women in their reproductive years, characterized by disruptions in hormonal balance, metabolic irregularities, and influences from lifestyle factors. Early diagnosis of PCOS is difficult due to the intricate relationship between clinical, hormonal, and lifestyle factors. In this study, a predictive model is proposed using machine learning techniques to detect PCOS based on hormonal and lifestyle factors. The predictive model is based on a dataset of 541 patient records, which includes lifestyle, clinical, and hormonal features. Our research incorporates the usage of four ML models, namely Extreme Gradient Boosting (XGBoost), Logistic Regression (LR), Random Forest (RF), and Support Vector Machine (SVM), which have been used to train the model using a stratified 5-fold cross-validation technique. Performance metrics are used to check the accuracy of the model, and the results are presented in the following sections. Analysis of the experimental outcomes shows that XGBoost performs better than the other models in prediction accuracy. The model also estimates a risk percentage, which enhances the interpretability of predictions. In this study, the machine learning model is used to detect PCOS, and the results show the potential of the model in the field of PCOS diagnosis.

Paper ID:ICA6NT 657

A Digital Twin Framework for Industrial System Monitoring, Data Processing and Optimization

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ABSTRACT

Digital Twin technology has emerged as one of the most transformative concepts in modern industrial systems, particularly within the paradigm of Industry 4.0. A digital twin can be defined as a dynamic virtual representation of a physical system that continuously receives data from real-world assets and uses this information to simulate, analyze, and optimize system performance. With the increasing integration of sensors, Internet of Things (IoT) devices, cloud computing, and advanced analytics, digital twins are becoming essential tools for improving operational efficiency, reducing downtime, and enabling predictive maintenance in industrial environments.

Traditional industrial monitoring systems rely primarily on periodic data collection and manual analysis, which often lead to delayed detection of system faults and inefficient decision-making. In contrast, digital twin frameworks provide real-time synchronization between the physical system and its virtual counterpart. This synchronization allows engineers and operators to observe system behavior in a digital environment, perform simulations, test control strategies, and identify potential failures before they occur in the physical system. As a result, industries can significantly reduce operational risks and maintenance costs while improving productivity and reliability.

This paper presents a comprehensive digital twin framework designed for industrial system monitoring, data processing, and intelligent decision support. The proposed framework focuses on the entire lifecycle of industrial data, beginning with data collection from sensors and physical devices, followed by secure communication through industrial networks, large-scale data processing in edge or cloud computing environments, and finally the creation of a dynamic digital twin model capable of advanced analytics and system optimization.

The architecture of the proposed framework is divided into multiple functional layers, including the physical layer, data acquisition layer, communication layer, data processing layer, and digital twin application layer. The physical layer represents real industrial assets such as machines, sensors, and actuators that generate operational data. The data acquisition layer collects and preprocesses this information using controllers, embedded systems, or edge computing devices. The communication layer ensures reliable and secure data transmission through protocols such as OPC UA, MQTT, and industrial Ethernet. The data processing layer performs large-scale analytics, machine learning computations, and predictive modeling. Finally, the digital twin application layer utilizes these processed data streams to create an accurate virtual representation of the physical system.

A key contribution of this work is the detailed explanation of how data flows across different layers of the digital twin architecture and how this data can be utilized to enable intelligent monitoring and predictive analytics. The framework also highlights the role of advanced computational technologies such as artificial intelligence, big data analytics, and cloud-based simulation in enhancing digital twin capabilities. By integrating these technologies, the digital twin system can provide real-time system insights, support predictive maintenance strategies, and optimize system performance through simulation-based decision-making.

In addition to presenting the framework architecture, this paper discusses several practical benefits of digital twin implementation, including improved operational efficiency, reduced maintenance costs, enhanced system visibility, and better decision support for industrial operators. At the same time, it also examines important challenges associated with digital twin adoption, such as data management complexity, cybersecurity risks, integration with legacy systems, and high computational requirements.

Overall, the proposed digital twin framework provides a structured approach for designing intelligent monitoring and analytics platforms for modern industrial environments. The framework can serve as a foundation for future research and development in smart manufacturing systems, enabling industries to fully leverage the potential of digital twin technology for improved productivity, reliability, and sustainability.

Index Terms – Digital Twin, Industry 4.0, IoT, Data Processing, Smart Manufacturing, Industrial Automation

Paper ID:ICA6NT 658

A DEEP LEARNING - BASED MONUMENT IDENTIFICATION SYSTEM WITH AR INTEGRATION

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ABSTRACT

This research focuses on the integration of deep learning and augmented reality technologies for intelligent monument identification and visualization. Cultural monuments represent important historical and architectural achievements, and digital technologies can enhance their exploration and preservation. The proposed system utilizes Convolutional Neural Networks (CNN) to detect and classify monuments from images captured through a mobile device camera. Once the monument is recognized, augmented reality technology overlays historical descriptions, multimedia content, and interactive elements directly onto the realworld environment. The system is designed to assist tourists, students, and researchers by providing instant information about monuments and their historical background. The deep learning model is trained using a large dataset of monument images to improve classification accuracy and reliability. The augmented reality module provides an immersive learning experience by presenting three-dimensional visualizations, location maps, and textual descriptions. The proposed framework contributes to digital heritage preservation and intelligent tourism systems.

A TIMESTAMP-AWARE RETRIEVAL-AUGMENTED GENERATION APPROACH TO INSTRUCTIONAL VIDEO NAVIGATION

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ABSTRACT

AI-powered teaching assistants are increasingly used to provide scalable, on-demand support; however, in video-centric courses, their effectiveness is limited by weak grounding in the instructional source and by the difficulty of locating precise moments within long recordings. This study aims to develop and evaluate a retrieval-augmented generation (RAG) teaching assistant specialized for video content that answers learner questions while explicitly linking responses to the most relevant video excerpts via timestamps. The end-to-end methodology ingests instructional videos, converts video to audio, transcribes speech with Whisper, and generates timestamps synchronized to the transcript. The transcribed text is segmented into semantically meaningful chunks, enriched with extracted metadata, and stored in a structured JSON representation. Each chunk is embedded into a vector space using an embedding model, with optimizations for bulk embedding generation to support large-scale video datasets. At query time, a similarity search retrieves candidate chunks, ranking algorithms prioritize the strongest evidence, and the ranked context is injected into a language model (either a local LLM or GPT-5) through prompt engineering; fine-tuning strategies are also considered to improve response quality. The implementation leverages common data-processing libraries and provides a user interface that presents grounded answers together with the corresponding video segments. Evaluation is framed through quantitative metrics (response time,

accuracy, and relevance), qualitative assessment of response faithfulness, comparative analysis against traditional teaching-assistant approaches and other AI educational tools, and user studies assessing satisfaction and real-world usability. Overall, this work establishes a practical architecture for timestamp-aware, video-based RAG tutoring, clarifies key design choices for faithful retrieval and generation over long-form recordings, and delineates limitations and future directions related to scalability, robustness, and ethical considerations in AI-assisted education.

Paper ID: ICA6NT 660

Design and Development of an Autonomous Fire Fighting Robot

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ABSTRACT

Fire accidents are one of the major causes of damage to life and property all over the globe. In many cases, firefighters have to face dangerous situations that are full of smoke, heat, and toxic gases. It is clear that the risks involved in such cases are very high. To minimize human involvement in such hazardous environments, robots can be used for the detection and extinguishing of fires.

The present paper discusses the design and development of an autonomous robot for the detection and extinguishing of fires. The robot is able to detect fire and extinguish it with the help of the components used in the system. These components include a flame sensor, ultrasonic sensor, and motor driver circuits. The flame sensor is used for fire detection, while the ultrasonic sensor is used for obstacle detection. The motor driver circuits enable the movement of the robot. A water pump is used for extinguishing the fire.

The proposed system is simple and efficient, and it can be used for fire extinguishing in indoor environments. Experimental results show that the robot is capable of detecting and extinguishing fires effectively.

Index Terms— Fire Fighting Robot, Arduino, Flame Sensor, Autonomous Robot, Embedded System

Paper ID:ICA6NT 661

Secure Communication Using the BB84 Quantum Key Distribution Protocol

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ABSTRACT

Secure communication over long-range wireless networks remains a critical challenge in resource-constrained and infrastructure-denied environments. This paper presents the design and implementation of a quantum-safe hybrid cryptographic communication system that integrates BB84 Quantum Key Distribution (QKD), AES-256-GCM authenticated encryption, and LoRa wireless technology for secure offline file transfer. The BB84 protocol, simulated using IBM Qiskit, generates a cryptographically secure shared secret key between two parties, which is distributed via QR code scanning in a Flutter-based Android mobile application. The generated quantum key is used to encrypt text, image, and audio files using AES-256-GCM, which provides confidentiality, integrity, and authenticity in a single operation through its built-in 128-bit authentication tag. The encrypted data is transmitted wirelessly between two ESP32 microcontrollers equipped with LoRa RA-02 modules operating at 433 MHz with acknowledgement-based reliable packet delivery mechanism. Hardware-level CRC verification provided by the LoRa module ensures additional packet-level error detection. The receiver decrypts the file using the shared quantum key, with the GCM authentication tag automatically detecting any tampering or corruption during transmission. The proposed system operates entirely offline without requiring internet connectivity, making it suitable for secure defense communication, disaster relief operations, and long-range wireless data transmission in infrastructure-denied environments. Experimental results demonstrate successful encryption and decryption of multiple file types with an overhead of only 28 bytes per file due to AES-256-GCM, confirming the efficiency and reliability of the proposed system.

Keywords — BB84, Quantum Key Distribution, AES-256-GCM, LoRa, ESP32, Flutter, Secure Communication, Offline Communication, Quantum Cryptography, Authenticated Encryption

Paper ID:ICA6NT 662

A Machine Learning Framework for Forecasting Digital Payment in Retail Business

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ABSTRACT

Digital payment systems such as Unified Payments Interface (UPI), mobile wallets, and QR-based payment systems are rapidly transforming financial transactions in the retail sector. However, many small retail vendors still rely on cash-based transactions due to technological barriers, lack of awareness, and concerns related to transaction security.

This research proposes a machine learning framework to predict digital payment platform adoption among retail vendors. Vendor characteristics such as smartphone availability, internet connectivity, transaction frequency, and digital literacy are analyzed to train predictive models. Algorithms including Logistic Regression, Decision Tree, and Random Forest are used to classify vendors based on their likelihood of adopting digital payments.

Experimental results show that Random Forest achieves the highest prediction accuracy compared with other algorithms. Visualization tools such as charts and flow diagrams are used to interpret vendor adoption trends. The proposed approach can support financial institutions and policymakers in promoting digital payment technologies among retail businesses.

Keywords – DigitalPayments,MachineLearning,RetailVendors,UPI,PredictiveAnalytics, Financial Technology.

An Explainable Deep Learning Framework for Brain Tumor Detection, Classification, and Severity Estimation using MRI Images

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ABSTRACT

Brain tumor diagnosis using MRI remains a complex task due to the heterogenous appearance and varying morphology of tumors. Traditional diagnostic methods require extensive manual interpretation by radiologists, which is time consuming and prone to variability. The proposed work automated deep learning-based brain tumor analysis system that integrated tumor detection, classification, localization, and its severity estimation within a unified pipeline. The suggested framework uses the VGG16 convolutional neural network and transfer learning to carry out a two-stage classification procedure that includes binary tumor identification and multiclass tumor classification. To enhance interpretability, Gradient weighted Class Activation Mapping (Grad-CAM) is employed to highlight the site responsible for model predictions. Additionally, the activation maps generated by Grad-CAM are used to estimate tumor location within the brain and compute tumor severity based on the tumor area. Experimental validation on a multi class MRI dataset containing glioma, meningioma, pituitary, and non-tumor images to demonstrate that the proposed approach achieved an accuracy of 97.56%, while the multi class classifier achieved 91.62% accuracy after fine tuning. The proposed system provides an interpretable output including tumor type, tumor location, heatmap visualization, and severity level. Such type of diagnostic system has the potential to help radiologists in early tumor detection and decision support aspects.

Keywords: Brain Tumor Detection, Magnetic Resonance Imaging (MRI), Convolutional Neural Networks (CNN), VGG16, Medical Image Classification, Explainable Artificial Intelligence (XAI), Grad-CAM, Tumor Severity Estimation.

Paper ID:ICA6NT 664

Design of a Terahertz Sensor Using Metamaterial

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ABSTRACT

Terahertz (THz) metamaterial sensors have become effective instruments for the highly sensitive, label-free detection of biological and chemical analytes. This work designs and analyzes a small metamaterial-based terahertz sensor for drug detection based on refractive index. The suggested structure is made up of a polyimide substrate, a continuous gold ground plane, and a metal–dielectric–metal combination with a patterned gold resonator. To improve electromagnetic field confinement and absorption efficiency, the resonator geometry includes a hexagonal structure with a C-shaped cut. The $8\ \mu\text{m} \times 8\ \mu\text{m}$ unit cell's small size allows for miniaturized sensing operations in the 0–10 THz frequency range. CST Studio Suite 2021 is used for numerical simulations. Based on changes in refractive index, the sensor achieves a high sensitivity of about 1.19 THz/RIU and displays a strong absorption resonance at 5.7 THz. Five diverse drug samples—cocaine, nicotine, heroin, amphetamine, and morphine—each with a unique refractive index value are used to assess the sensing capability. Reliable drug material identification is made possible by the suggested structure's distinct resonance frequency shifts that correlate to variations in the analyte refractive index. Furthermore, polarization analysis confirms polarization-insensitive behavior by revealing very comparable responses for transverse electric (TE) and transverse magnetic (TM) modes. Strong field localization around the resonator edges is also seen by surface current analysis. The findings show that the suggested metamaterial sensor has strong electromagnetic confinement, stable resonance characteristics, and high sensitivity, making it a viable option for terahertz-based pharmaceutical screening, biological sensing, and security detection systems.

Keywords—Terahertz sensors, metamaterials, refractive index sensing, biomedical detection, drug sensing, metamaterial absorber, THz spectroscopy.

Paper ID:ICA6NT 665

Neuro AI: A Deep Learning Pipeline for MRI Image Enhancement and Explainable Alzheimer's Disease Diagnosis

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ABSTRACT

Alzheimer disease (AD) is a massive menace that cuts across over 55, millennials in the world. Nevertheless, it does not help much as nurses and doctors cannot detect it at an early stage since MRI scanners employed in various clinics are not precisely identical which confuses the data. It is called Neuro AI, we have designed a complete pipeline that not only makes the brain scans comparable, but also tries to identify whether a person is Cognitively Normal (CN), has Mild Cognitive Impairment (MCI), or has in fact Alzheimer. Our test processed 202 scans of the OASIS-3 longitudinal dataset, inputted them into three harmonization passes FusionNet to smooth out the contrast, CycleGAN to replace domain styles with no paired examples, and SRGAN to double the resolution to 2x then used them on a balanced test set at which 99.95 percentage accuracy was nailed by a MobileNetV3-Small classifier. We also included GradCam to visualize the components of the image that contribute to the decision and a TinyLLaMA language model to automatically generate structured clinical reports which can all be viewed through an interactive Streamlit web app.

Paper ID: ICA6NT 666

Machine Learning Based Spatiotemporal Urban Air Quality Prediction Using IoT Sensors and Mobility Aware Feature Engineering

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ABSTRACT

Urban air pollution has become a major environmental and public health concern due to rapid industrialization, vehicular emissions, and population growth. Traditional monitoring systems rely on limited fixed stations, which fail to provide fine-grained spatial and temporal air quality information. This paper proposes a Machine Learning Based Spatiotemporal Urban Air Quality Prediction System using IoT Sensors and Mobility-Aware Feature Engineering. The system integrates low-cost IoT gas sensors deployed at fixed and mobile locations with real-time data transmission through MQTT protocol. Collected pollutant data, including CO, NO₂, and PM concentrations, are preprocessed and enhanced using mobility-aware feature extraction techniques. Machine learning models are trained to predict air quality levels with improved accuracy and reduced prediction error. Experimental results demonstrate reliable pollutant forecasting performance with optimized evaluation metrics such as RMSE and R² score. The proposed framework provides a scalable, cost-effective, and intelligent solution for smart city environmental monitoring and decision-making support.

Keywords—Air Quality Prediction, Internet of Things (IoT), Spatiotemporal Analysis, Machine Learning, Mobility-Aware Feature Engineering, MQTT Protocol, Random Forest, LSTM, ESP32, Environmental Monitoring.

Paper ID: ICA6NT 668

VERIFIABLE ENCRYPTED IMAGE RETRIEVAL WITH REVERSIBLE DATA HIDING IN CLOUD ENVIRONMENT

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ABSTRACT

This system introduces a secure and efficient method for verifiable encrypted image retrieval with reversible data hiding in a cloud environment. To address privacy concerns in Content-Based Image Retrieval (CBIR), image features are extracted using the VGG16 deep learning algorithm and secured through homomorphic encryption, preventing the cloud server from inferring content from plain feature indexes or queries. Authentication codes are generated and embedded into encrypted images using Reversible Data Hiding, enabling verification of retrieved results and detection of any manipulation. The Flickr dataset is utilized for training and evaluation, with comparative analysis against ResNet50, where VGG16 achieves a superior accuracy of 98.3%. The retrieval mechanism ensures that similar query images produce similar encrypted indexes, enabling accurate matching without revealing sensitive data. To optimize computation time and resource usage, a caching mechanism is integrated, storing previous search results at the server side and retrieving them instantly for repeated queries, thus avoiding redundant processing. The performance evaluation demonstrates that the proposed encrypted search method and caching significantly reduce computation time compared to conventional KNN-based retrieval. The integration of deep learning, homomorphic encryption, reversible data hiding, and caching provides both high retrieval accuracy and robust security in outsourced image search scenarios.

Paper ID:ICA6NT 669

AI-BASED SMART JOB RECOMMENDATION AND NOTIFICATION SYSTEM

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ABSTRACT

Digital recruitment platforms have transformed job searching, yet applicants still face challenges such as repetitive searches, limited ATS transparency, and fraudulent job postings. This research proposes an AI-Based Smart Job Recommendation and Notification System to assist job seekers in finding suitable opportunities and improving their resumes for automated hiring systems. The system uses NLP to extract structured data from resumes, including skills, education, and work history. An ATS evaluation module assesses resume quality, while a recommendation engine combining Large Language Models (LLM) and Retrieval-Augmented Generation (RAG) suggests resume improvements and enhances job matching. The system further includes job safety assessment and automated notifications for relevant job openings. Designed to be modular and scalable, the proposed system aims to reduce the time and effort involved in job searching through transparent and explainable AI-driven recruitment tools.

Paper ID:ICA6NT 670

ADVASELL: AN AI-POWERED DYNAMIC PRICING SYSTEM USING LINEAR REGRESSION FOR E-COMMERCE PLATFORMS

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ABSTRACT

Dynamic pricing is a crucial strategy for ecommerce platforms aiming to optimize sales and maximize profits in today's competitive digital marketplace. This paper presents AdvaSell, an innovative AI-powered dynamic pricing system that leverages linear regression algorithms to predict optimal product prices based on comprehensive features including product category, brand reputation, current stock levels, historical sales trends, and market demand patterns. The proposed system demonstrates exceptional predictive accuracy with a coefficient of determination ($R^2 = 0.9945$), indicating robust performance in real-world scenarios. We provide a comprehensive analysis of system architecture, dataset preparation methodologies, advanced feature engineering techniques, model development processes, and practical implementation strategies. Additionally, we conduct comparative evaluations with Gradient Boosting Machines (GBM) and Ridge Regression to assess trade-offs between accuracy, interpretability, and computational efficiency. A sophisticated web-based user interface was developed for seamless deployment and user interaction. The system addresses key challenges in dynamic pricing including inventory management, demand forecasting, and competitive positioning. Future research directions encompass reinforcement learning integration, real-time competitor monitoring, automated retraining pipelines, and personalized pricing strategies.

Paper ID:ICA6NT 671

AI-POWERED INTEGRATED HOSPITAL MANAGEMENT SYSTEM WITH INTELLIGENT HEALTH ASSISTANT AND RESOURCE OPTIMIZATION

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ABSTRACT

Modern hospitals face significant challenges in managing patient care, resources, and administrative tasks efficiently. This paper presents an integrated Hospital Management System powered by Artificial Intelligence that combines patient care, resource optimization, emergency services, and intelligent health assistance. The system features AI-driven disease prediction, dynamic resource allocation, blood bank management with real-time donor tracking, telemedicine capabilities, and a conversational health assistant (AIDOC). Using machine learning models including Random Forest, Logistic Regression, and Natural Language Processing, the system achieves intelligent automation across multiple hospital operations. The platform supports role-based access for admins, doctors, patients, pharmacy staff, and insurance agents. Key innovations include AI-based early disease detection, automated blood donor notification system, insurance claim validation, and predictive resource forecasting. Implementation uses Flask framework, OpenStreetMap API for geolocation services, and OpenAI API for conversational AI. This comprehensive solution addresses critical gaps in healthcare delivery by integrating clinical, administrative, and emergency services into a unified intelligent platform.

Paper ID:ICA6NT 675

FERTIGATION/IRRIGATIONCONTROLSYSTEMFOR AGRICULTURE USING ESP32

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ABSTRACT

Efficient utilization of water and fertilizers plays a vital role in sustainable agriculture. This paper presents the development of an IoT-enabled fertigation and irrigation control system designed to automate nutrient and water management in agricultural applications.

The proposed system is centered around an ESP32 microcontroller that gathers real-time data from pH and Electrical Conductivity (EC) sensors to assess water quality and nutrient concentration. Based on these measurements, the controller automatically operates water and fertilizer pumps to maintain suitable conditions for plant growth. Flow sensors are incorporated to measure the quantity of liquid delivered, ensuring accurate nutrient dosing and preventing excessive usage.

Experimental testing indicates improved precision in nutrient supply, reduced manual intervention, and better water-use efficiency. The developed system offers a cost-effective and scalable solution for precision farming, contributing to optimized resource management and enhanced agricultural productivity.

Paper ID: ICA6NT 677

An Enhanced Network Intrusion Detection System Using CNN- LSTM Deep Learning Techniques

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ABSTRACT

The scale and frequency of cyber-attacks have been on the rise with the fast development of internet services and digital communication. The conventional intrusion detection technologies do not effectively identify sophisticated patterns of attacks because they require predefined rules and signatures. In order to overcome this shortcoming, the current study suggests a hybrid deep learning architecture that integrates Convolutional Neural Networks (CNN) and Long Short-Term Memory (LSTM) networks in order to achieve successful network intrusion detection. The suggested system is trained on the CICIDS2017 data that has realistic network traffic data with both normal and malicious activities. The CNN element derives salient spatial characteristics of the network traffic data whereas the LSTM layer derives temporal behavioural trends of the network flows. The model identifies four types of network traffic, namely, Benign, DoS, DDoS, and Bot attacks. The results of the experimental Myths show that the hybrid CNN-LSTM model is an effective way to detect various types of cyber threats and is more effective than the traditional methods of detection. The suggested system might be used to enhance the security in the network through accurate and automated intrusion detection

Index Terms – Intrusion Detection System, Deep Learning, CNN, LSTM, Network Security, CICIDS2017

Paper ID: ICA6NT 685

Comparative Analysis of Encoder-Based U-Net Architectures for Automated Retinal Vessel Segmentation with an Optimized VGG19 Framework

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ABSTRACT

Automated retinal vessel segmentation of blood vessels in retinal fundus images plays a essential role in medical image analysis software, particularly in the domain of ophthalmology. This paper proposes an optimized approach for automated retinal vessel segmentation, leveraging the integration of deep learning techniques with U-Net architecture and ResNet-based feature extraction. The methodology aims to enhance segmentation accuracy by incorporating neural network optimization strategies, addressing challenges like as vessel discontinuity and complex retinal structures. By applying advanced learning mechanisms, the model demonstrates improved performance in segmenting blood vessels in fundus retinal images. Experimental results validate the strength of the proposed method demonstrating its potential for accurate and efficient diagnosis support in ophthalmology applications.

Keywords :Automated retinal vessel segmentation, Fundus retinal images, Deep learning, U-Net architecture, ResNet integration, Medical image analysis, Neural network optimization, Computer-aided diagnosis, Ophthalmology, Segmentation accuracy.

Paper ID: ICA6NT 686

OPTIMIZED RANDOM FOREST MODEL FOR HEART DISEASE PREDICTION USING BAYESIAN TECHNIQUES

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ABSTRACT

Cardiovascular disease is one of the most prevalent causes of mortality in the world, and the timely and correct assessment of risks should be of great value. This project is a prediction system of heart diseases based on machine learning, created with the help of the Random Forest algorithm and Bayesian hyperparameter optimization to improve the performance of the models and their generalization. The data, which comprises of clinical features like age, blood pressure, cholesterol levels, the type of chest pain and the highest heart rate, is processed using data cleaning, data normalization and feature refinement to maintain reliability. The ensemble learning method combines several decision trees to decrease overfitting and enhance prediction stability, whereas the Bayesian optimization is an effective method to determine the best model parameters. The trained model is implemented in the form of a web-based application to perform real-time prediction and produce downloadable medical evaluation report. The effectiveness of the proposed system is proved by experimental evaluation with the help of such standard performance measures as accuracy, precision, recall, and F1-score. The created framework is a supportive decision support tool of the initial cardiovascular risk screening and it demonstrates the relevance of machine learning methods in the setting of healthcare organizations.

Paper ID:ICA6NT 690

Neural Latent Alignment: A Self-Supervised Approach to Closing the Sim-to-Real Gap for Humanoid Locomotion in Unstructured Terrains

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ABSTRACT

Achieving zero-shot transfer for humanoid locomotion from simulation to the physical world remains a fundamental challenge due to the "Sim-to-Real" gap, which is characterized by discrepancies in physics, sensor noise, and environmental dynamics. We propose **Neural Latent Alignment (NLA)**, a self-supervised framework that maps high-dimensional multimodal inputs—including RGB-D, IMU, and Joint States—from both simulation and real-world domains into a shared, domain-invariant latent space Z . By enforcing a contrastive objective, the control policy becomes agnostic to the source of the data. Experiments conducted on a 20-DOF humanoid demonstrate a **34% increase in stability** across unstructured terrains, such as gravel and stairs, compared to traditional domain randomization methods.

Paper ID:ICA6NT 691

AI-Driven 6G Frameworks for Real-Time Collaborative Learning Ecosystems: Analyzing Latency and Data Flow

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ABSTRACT

The paradigm shift towards digital pedagogy relies heavily on collaborative platforms like Padlet, Trello, and Notion to facilitate interactive group work and decentralized learning. However, as these environments increasingly integrate high-definition multimedia and simultaneous multi-user interactions, real-time synchronous instruction and dynamic digital evaluation systems demand ultra-low latency and massive bandwidth. Current networks frequently struggle to accommodate these rigorous demands, resulting in network bottlenecks that directly disrupt seamless peer-to-peer engagement and compromise objective student assessments. To address these critical limitations, this paper proposes an Artificial Intelligence (AI) driven 6G communication framework specifically designed to optimize data flow and minimize latency within collaborative educational ecosystems. Utilizing Python-based machine learning models deployed directly at the network edge, the system continuously monitors and analyzes complex traffic patterns generated by diverse educational tools. The intelligent framework dynamically classifies data packets, heavily prioritizing latency-sensitive pedagogical tasks—such as live automated assessments, interactive video discussions, and real-time co-authoring—over routine background synchronization processes. By employing advanced predictive analytics and time-series forecasting, the Python-driven model anticipates peak network usage intervals and intelligently allocates 6G Ultra-Reliable Low-Latency Communication (URLLC) spectral resources. Simulated network evaluations demonstrate significant reductions in end-to-end latency, minimized jitter, and vastly improved packet delivery ratios compared to traditional routing protocols. Ultimately, integrating edge AI with 6G infrastructure provides a highly scalable and reliable technological foundation. This synergy ensures a frictionless, equitable collaborative environment that fully supports advanced teaching methods, robust group dynamics, and real-time evaluation systems in next-generation smart classrooms.

Paper ID:ICA6NT 700

AI-DRIVEN MULTILINGUAL COLLEGE CHATBOT USING RETRIEVAL-AUGMENTED GENERATION

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ABSTRACT

The intelligent conversational systems have been expanding at a very high rate therefore creating new horizons on rising accessibility of information within learning institutions. The paper provided reports the design and implementation of a multilingual AI-based chatbot of a college assistant in Rajeev Gandhi Memorial College of Engineering and Technology (RGM CET). The suggested system allows a student, parent and a visitor to get access to right institutional information through a conversational interface. The chatbot is developed in the Retrieval-Augmented Generation (RAG) format that entails semantic search and a massive language model to come up with response that depends on context. The information recorded in the structured body of knowledge is institutional information (departments, information about the faculty, facilities, admissions and campus services), and indexed through the help of the vector embeddings. The FAISS similarity search engine requests the search material of interest in the form of knowledge fragments and, then, the knowledge with the Llama-3 language model through the Groq API to provide out the relevant answers. The system also has multilingual interaction since the user is able to use languages like the English, Telugu, Hindi, Kannada, Tamil and Malayalam. Whisper speech recognition model is employed in the translation of speech queries to text enabling voice interaction. The other features are smart follow-up propositions, image and document view and a campus navigation module which computes the travel distance using the geolocation and (Haversine) algorithm. The system enhances easy accessibility of institutional information and decreases the labor that is being done by the administrative staff.

Paper ID:ICA6NT 701

Beyond CMOS: Nanoelectronic devices and their VLSI integration

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ABSTRACT

The sustained development of the complementary metal oxide semiconductor (CMOS) technology has been the major factor enabling VLSI progress over the last several decades. However, as the sizes of the devices are being reduced down to the scale of atoms, quantum physical limitations such as short channel effects, increasing leakage currents, and interconnect delays heavily limit the scenarios for further increase of performance. This paper is a survey of various emerging nanoelectronic devices that can be potential CMOS successors or co-processors in future VLSI systems. The authors do a deep dive into the set of beyond CMOS technologies which include carbon nanotube FETs, tunnel FETs, nanowire FETs, single electron transistors, graphene-based devices, and spintronic devices. The review covers in detail each technology's working mechanism, performance metrics, and the extent to which they can be integrated into VLSI. The paper features a discussion about the main integration bottlenecks like fabrication scalability, process compatibility, device variability, and thermal management. On top of that, the paper outlines the promising areas of the future such as hybrid CMOS, nanoelectronic architecture and industry roadmap co-alignment. The paper intends to be a worthwhile resource for researchers and engineers by providing them with a well, organized insight into where nanoelectronic device integration in VLSI design stands today and where it is heading.

Keywords: VLSI, nanoelectronics, beyond CMOS, CNTFET, TFET, nanowire FET, single-electron transistor, graphene, spintronics, nanotechnology.

Paper ID:ICA6NT 702

Intelligent Edge Computing and Dynamic Resource Allocation in 6G UAV-Assisted Networks using Deep Reinforcement Learning

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ABSTRACT

The evolution towards Sixth-Generation (6G) communication networks promises unprecedented capabilities, including Terahertz (THz) band utilization, microsecond latency, and ubiquitous three-dimensional coverage. Unmanned Aerial Vehicles (UAVs) acting as flying base stations or edge servers are critical to realizing this 3D network architecture, particularly in dynamic or disaster-struck environments. However, the high mobility of UAVs and the fluctuating demands of ground users present severe challenges for real-time resource allocation and energy management. This paper proposes a novel framework utilizing Deep Reinforcement Learning (DRL) to dynamically optimize edge computing resources and spectrum allocation in 6G UAV-assisted networks. By formulating the environment as a Markov Decision Process (MDP), we deploy a Deep Deterministic Policy Gradient (DDPG) algorithm to minimize total network latency while maximizing energy efficiency. Extensive simulation results demonstrate that the proposed DRL-based approach outperforms traditional optimization heuristics, offering a robust, autonomous solution for ultra-reliable low-latency communications (URLLC) in next-generation networks.

Paper ID:ICA6NT 707

PROGNOSIS AND CLASSIFICATION OF PCOS (DISEASE PREDICTION) USING ATTENTION MECHANISM ON MULTIMODALITY DATA

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ABSTRACT

Polycystic Ovary Syndrome (PCOS) is one of the most prevalent endocrine disorders affecting women of reproductive age and is a major cause of infertility and metabolic complications. Accurate and early diagnosis of PCOS remains challenging due to heterogeneous symptoms, overlapping clinical manifestations, and the reliance on time-consuming and costly diagnostic procedures such as hormonal analysis and ultrasound imaging. In this study, an optimized artificial intelligence framework is presented for effective PCOS prognosis and classification using multi-modality data comprising clinical features and ovarian ultrasound images. Feature Engineering is applied to reduce the dimensionality of clinical data, and machine learning models such as Logistic Regression, Naïve Bayes, and Support Vector Machine are employed for classification. In parallel, deep learning techniques, including the VGG16 architecture with transfer learning, are utilized for ultrasound image analysis, achieving high diagnostic accuracy. Such attention-augmented models can dynamically learn contextual dependencies, reduce noise influence, and enhance generalization across diverse patient profiles. The proposed extension aims to improve diagnostic precision, reduce false positives, and increase clinical reliability, making the system suitable for real-world deployment in early PCOS screening and decision-support applications.

Paper ID:ICA6NT 708

Hybrid Feature Selection and Nested Cross-Validation for Potato Crop Yield Prediction

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ABSTRACT

To boost the production of crops and ensure food security, accurate crop yield forecasting is crucial. This study proposes a hybrid feature selection and optimal machine learning framework for predicting potato crop yield. The proposed approach integrates Random Forest feature importance, XGBoost feature importance, and SHAP feature importance to identify the most relevant predictors influencing crop productivity. On the initial dataset, the top 30 most significant features were selected using the hybrid feature selection strategy. The present study uses three models—Enhanced Random Forest (RF), XGBoost, and Enhanced Multilayer Perceptron (MLP)—which were trained using nested cross-validation and hyperparameter tuning to enhance their robustness and generalizability. The performance criteria utilized to assess the models included the coefficient of determination (R^2), root mean square error (RMSE), mean absolute error (MAE), and mean absolute percentage error (MAPE). According to experimental results, the XGBoost model had the best prediction accuracy ($R^2 = 0.977$), followed by the Enhanced Random Forest ($R^2 = 0.975$). The Enhanced MLP model has a R^2 of 0.972, which was a little lower than the other models. The results show that using hybrid feature selection with nested cross-validation greatly increases the accuracy of predictions and the stability of the model. This framework can help precision agriculture systems make decisions based on data that will help them grow more potatoes.

Paper ID:ICA6NT 709

PROVISION OF NOMA IN POWER DOMAIN

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ABSTRACT

Mobile Internet and connected devices, offering a variety of services at different levels of performance, represents a major challenge for the fifth generation of wireless networks and beyond. This requires a paradigm shift toward the development of key enabling techniques for the next generation wireless networks. In this respect, NOMA (Non orthogonal multiple access) has recently emerged as a new communication paradigm to provide ubiquitous connectivity in radio frequency communications. The key feature of NOMA is to serve multiple users at the same time/frequency/code, but with different power levels, which yields a significant spectral efficiency gain over conventional orthogonal multiple access.

Paper ID:ICA6NT 714

SENIORSHIELD: A Machine Learning Powered IoT Ecosystem For Senior Citizen Wellness

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ABSTRACT

This research proposes an advanced form of a multi-modal edge-intelligent system for the detection of elderly emergency situations in real-time by leveraging IoT sensor fusion techniques along with the ElderGuard system. Phase 2 extends the previously proposed single-parameter fall detection system by incorporating motion information from the accelerometer and gyroscope of the MPU6050 sensor, physiological information from the heart rate sensor of the MAX30102 module, and the SOS button into a single Emergency Risk Score system with edge inference support from the XGBoost algorithm. On our system, the fall detection has a 93–96 percent accuracy with a false positive less than 6 percent and an end-to-end alerting latency of 450–500 ms with edge inference on the ESP32. Our system achieves a 10–20× improvement compared to cloud-based systems while reducing false positives by 30% compared to ElderGuard. Threshold-based contextual fusion categorizes the severity of the alerts into Normal, Warning, and Critical. The backend of the system utilizes a React.js-based real-time caregiver dashboard and SQLite as the storage component through a Python Flask-based REST API. The system uptime was consistently above 98% over 24 hours of continuous testing. There were no false dismissals of SOS conditions. Overall, the framework proves that edge-based machine learning with sensor fusion provides a viable solution for autonomous management of senior safety.

Keywords: Elderly Safety, Internet of Things (IoT), Sensor Fusion, Edge Computing, Fall Detection, ESP32, Multi-Modal Detection, Emergency Risk Score, XGBoost, Health Monitoring, Ambient Assisted Living

Paper ID:ICA6NT 716

MACHINE LEARNING-ENHANCED LORA-BASED AMBULANCE PRIORITY TRAFFIC CONTROL SYSTEM

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ABSTRACT

Urban traffic congestion significantly delays emergency vehicles, particularly ambulances, where response time is directly linked to patient survival. Conventional traffic signal systems operate on fixed timing schemes and lack intelligent mechanisms for reliable emergency vehicle prioritization. This paper proposes a Machine Learning-Enhanced LoRa-Based Ambulance Priority Traffic Control System that integrates long-range wireless communication with intelligent siren classification for accurate signal pre-emption. The architecture combines a LoRa transmitter installed in the ambulance with a LoRa receiver at the traffic junction to enable early emergency notification. To minimize false triggering caused by environmental noise or unauthorized signals, the system employs a dual-verification mechanism in which directional microphones capture audio signals and extract Mel-Frequency Cepstral Coefficient (MFCC) features for classification using a trained machine learning model. Only when both communication and audio confirmation are validated does the controller activate a priority green signal for the corresponding lane. After the ambulance clears the junction, normal signal timing is automatically restored. The proposed framework enhances reliability, reduces emergency clearance time, and provides a scalable solution suitable for smart city traffic infrastructure.

Paper ID:ICA6NT 717

DISASTER ALERT AND RESCUE COMMUNICATION SYSTEM USING LORA MESH NETWORK

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ABSTRACT

Natural disasters such as earthquakes, floods, landslides and cyclones frequently disrupt communication infrastructures including cellular networks and internet services. Lack of communication significantly delays rescue operations and emergency coordination. This paper proposes a disaster alert and rescue communication system using a LoRa mesh network capable of providing long-range and low-power wireless communication during emergency situations. The proposed system integrates environmental sensors, microcontroller processing units and LoRa communication modules to create an independent communication network that does not rely on existing infrastructure. When abnormal environmental conditions are detected, alert messages are transmitted through the mesh network to monitoring stations and rescue teams. The decentralized architecture ensures that messages can be relayed through multiple nodes, improving reliability even when some nodes fail. Experimental evaluation demonstrates that LoRa technology provides efficient long-distance communication while consuming minimal power, making the system suitable for disaster monitoring and early warning applications.

Paper ID:ICA6NT 718

CLEANCITY:WASTE REPORTING AND MANAGEMENT SYSTEM

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ABSTRACT

Clean City provides a smart waste reporting and management system to improve the disposal and monitoring of waste in rural areas. Villagers can submit a waste report by capturing images, indicating where they are located and selecting the language of their choice. For those who don't have access to a smart device, they can still use the landline option to provide a complaint. Panchayat and sanitation workers will receive the waste report, track it and provide a transparent update on the current status of the report. Clean City will enhance communication, accountability, and overall cleanliness in rural communities through village performance monitoring and simplified reporting capabilities.

Paper ID:ICA6NT 719

AccessAble: Discovering Accessible Education and Jobs for Wheelchair Users

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ABSTRACT

People who have difficulty moving around, especially those using wheelchairs, can find it challenging to locate schools or workplaces with accessible buildings since most of the existing resources do not clearly indicate information about features such as ramps, elevators, and restrooms. AccessAble is a digital tool that will allow users to search for educational institutions (schools or colleges) and job opportunities based on their needs and wants through an interactive map interface, where they can view ratings for accessibility as well as filter by the type of work they want to do and how accessible the building is to meet these needs or wants. AccessAble will also direct users to additional resources for developing the skills they need to obtain these types of positions, such as via SWAYAM or Coursera, making it easier for them to pursue higher education and make informed career choices based on the fact that both types of resources are available digitally and include disability learning opportunities.

Keywords: Accessible employment, wheelchair accessibility, inclusive workplaces, accessible education, barrier-free infrastructure, accessibility mapping, inclusive hiring, workplace accessibility, mobility-friendly navigation, accessibility rating systems, inclusive job discovery, accessibility data analytics.

Paper ID:ICA6NT 720

AI-POWERED MONITORING OF CROP HEALTH AND SOIL CONDITION USING MULTISPECTRAL IMAGING

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ABSTRACT

Advancements in precision agriculture increasingly rely on the combination of artificial intelligence (AI) and multispectral imaging for effective crop and soil monitoring. This research proposes a novel AI-based framework that analyzes multispectral data collected from drones and satellite sensors to assess crop health and soil condition. Key vegetation indices, including NDVI, GNDVI, and NDRE, are calculated to identify plant stress, growth patterns, and nutrient deficiencies, while spectral features help estimate soil characteristics such as moisture and organic content. Machine learning techniques, including convolutional neural networks and ensemble models, process this data to provide accurate, real-time insights. Field experiments across multiple crop types indicate that the system can detect crop stress and suboptimal soil conditions early, enabling timely interventions. The integration of AI with multispectral imaging presents an efficient, scalable, and non-invasive approach to enhancing crop productivity and sustainable agricultural management.

Paper ID:ICA6NT 722

BRAIN TUMOR DETECTION

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ABSTRACT

The domain of the present project is generalized healthcare, with specific application in brain tumor detection using medical image processing techniques. The proposed system uses deep learning techniques such as Convolutional Neural Networks (CNN) and transfer learning using EfficientNetB0. In the present project, a deep learning-based approach is proposed for brain tumor classification into multi-classes using MRI images provided in the BRISC 2025 dataset. A Convolutional Neural Network (CNN) architecture is implemented along with transfer learning using EfficientNetB0 architecture for brain tumor classification into glioma, meningioma, pituitary tumor, and no tumor classes. Various preprocessing techniques are used to improve the generalization capabilities of the proposed models. Accuracy, precision, recall, and F1-score metrics are used to evaluate the proposed models. From the results, it is clear that deep learning techniques can be used effectively in brain tumor detection using MRI scan images

Paper ID:ICA6NT 724

Automatic Firefighting Robot

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ABSTRACT

This paper presents the design and implementation of an Automatic Patrolling and Firefighting Robot, an intelligent autonomous system engineered to enhance indoor safety protocols by providing rapid, early-stage fire detection and suppression capabilities without requiring immediate human intervention. The escalating need for proactive safety measures in critical indoor environments, such as industrial warehouses, laboratories, and factories, necessitates systems capable of continuous surveillance and targeted response. Our proposed robotic platform addresses this requirement by integrating a multi-modal sensor suite comprising flame, combustible gas, and temperature sensors to continuously monitor ambient conditions during autonomous patrolling cycles.

KEYWORDS: Autonomous Robotics, Fire Suppression, Computer Vision, Real-time Monitoring, Sensor Fusion, Embedded Systems, IoT, Targeted Control

Paper ID:ICA6NT 728

Kidney Stone Detection Using Deep Learning CNN Model

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ABSTRACT

Kidney stone disease is a prevalent medical condition affecting millions worldwide, causing severe pain and potentially serious complications if undetected at an early stage. Conventional diagnosis relies on manual inspection of CT scans and ultrasound images by radiologists, a process that is time-consuming and susceptible to human error. This paper proposes a deep learning-based automated kidney stone detection system using Convolutional Neural Networks (CNN). The proposed model processes medical images through a multi-stage pipeline comprising preprocessing, hierarchical feature extraction, and binary classification. The system achieves an accuracy of 95.8%, precision of 94.5%, recall of 96.2%, F1-score of 95.3%, specificity of 95.1%, and an ROC AUC of 0.97, with a near real-time inference time of 0.8 seconds per image. Experimental results demonstrate that the proposed CNN-based system significantly outperforms traditional machine learning approaches and offers a reliable, efficient, and clinically applicable solution for assisting healthcare professionals in kidney stone diagnosis.

Keywords— Kidney Stone Detection, Convolutional Neural Network, Deep Learning, Medical Image Analysis, CT Scan, Computer-Aided Diagnosis, Image Classification.

Paper ID: ICA6NT 730

FAKE NEWS DETECTION USING NLP: A COMPARATIVE STUDY OF BERT AND MULTINOMIAL NAIVE BAYES MODELS

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ABSTRACT

Fast spreading of completely made-up stories that are shared online through different channels is a serious problem for the trust of information that influences people's views, political decisions, and social stability. As a result, we have developed a hybrid automated AI-based fake news detection model that combines feature extraction with Multinomial Naive Bayes (MNB) and Bidirectional Encoder Representations from Transformers (BERT). Our device basically employs the contextual awareness and worldwide language comprehension of a transformer-based architecture and simultaneously, it offers the clarity and less time aspect of a probabilistic model. Various datasets such as the Kaggle Fake News dataset and ISOT dataset have been utilized for training and testing the two models with an accuracy close to 98.5% for BERT and 88.2% for Naive Bayes. The findings of the experiment highlight that the hybrid fusion approach results in an increase in recognition rate, model robustness, as well as explanation capability, and the efficiency is also retained. The flow of the system covers the stages of data preprocessing, text vectorization, model training, and ensemble prediction. Moreover, explainable AI (XAI) techniques are implemented to maintain transparency and trust in the classification process. The present method is paving the way for the ethical use of AI and digitally informed communication by offering trustworthy and interpretable AI-powered tools for misinformation identification.

Paper ID:ICA6NT 731

Instinctive Autonomous Tactical Override System (IATOS) for UAVs And Aircrafts

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ABSTRACT

Unmanned Aerial Vehicles (UAVs) require reliable autonomy for operations in disaster zones, military environments, and dense urban areas where Global Positioning System (GPS) signals are degraded or unavailable. This work presents the design and implementation of an Instinctive Autonomous Tactical Override System (IATOS) that enables UAVs to continue missions under adverse conditions. The system integrates multi-sensor fusion (IMU, barometer, magnetometer, and vision), AI-based path planning, and fail-safe navigation logic. Visual-Inertial Odometry combined with federated sensor fusion ensures stable localization in GPS-denied scenarios, while reinforcement learning and obstacle-detection algorithms enable adaptive trajectory planning. MATLAB/Simulink simulations demonstrate successful autonomous navigation, real-time obstacle avoidance, efficient power optimization, and emergency landing capabilities. The results confirm that IATOS provides a robust framework for resilient UAV autonomy in complex environments.

Keywords: UAVs, GPS-denied navigation, multi-sensor fusion, dead reckoning, AI path planning, obstacle avoidance, visual odometry, reinforcement learning.

Paper ID: ICA6NT 732

AI-Based Financial Advisor for Investment Decisions

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ABSTRACT

The rapid growth of global financial markets and the increasing complexity of investment tools have made it harder for individual and retail investors to make decisions. Traditional financial advisory systems rely on manual analysis and human expertise, which can be slow, expensive, biased, and out of reach for many investors. To address these issues, this paper suggests an AI-based financial advisor that helps with smart, data-driven investment choices using machine learning, deep learning and natural language processing techniques. The proposed system combines various data sources, including historical market data, technical indicators, investor risk profiles, and market sentiment from financial news, to create personalized and risk-aware investment recommendations. Supervised machine learning models predict market movements, while Long Short-Term Memory (LSTM) networks are used for time-series forecasting, capturing patterns in stock price data over time. Sentiment analysis is also included to improve prediction accuracy by reflecting real market emotions.

Additionally, the system offers portfolio optimization and dynamic rebalancing to increase returns and reduce investment risk. Experimental results show better forecasting reliability and more effective Buy/Hold/Sell recommendations compared to traditional advisory methods. Overall, this framework presents a scalable, cost-effective, and unbiased alternative to standard financial advisory services. It supports informed investment choices while enhancing professional financial judgment instead of replacing it.

Paper ID: ICA6NT 734

ENHANCING SECURITY AND RELIABILITY THROUGH INTELLIGENT VIDEO SURVEILLANCE SYSTEM (IVSS): A MODULAR AI-DRIVEN APPROACH

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ABSTRACT

Traditional video surveillance systems often suffer from false positives, unlogged false negatives, and limited adaptability to real-world conditions. This paper presents an Intelligent Video Surveillance System (IVSS) that integrates advanced deep learning models, fine-tuning strategies, and robust alert mechanisms to improve detection quality and precision. By evaluating YOLOv8 against alternative architectures, optimizing hyperparameters, and addressing edge cases such as low lighting and frame corruption, the proposed IVSS achieves higher reliability and scalability. The system also incorporates improved face recognition, modular deployment, and a comprehensive evaluation suite, making it suitable for smart cities, industrial zones, and institutional security.

Paper ID:ICA6NT 737

Blockchain Beyond Cryptocurrency

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ABSTRACT

Blockchain technology, initially popularized through Bitcoin and other cryptocurrencies, has rapidly evolved into a transformative tool across industries. Its decentralized, transparent, and immutable nature makes it suitable for applications far beyond digital currency. This paper explores the diverse use cases of blockchain, its potential benefits, challenges, and future directions.

Paper ID:ICA6NT 738

The Convergence of Quantum Computing and Artificial Intelligence in Cybersecurity: A Survey of Emerging Threats and Post-Quantum Solutions

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ABSTRACT

The fact that the field of quantum computing has evolved much faster is a two edged sword for the world of artificial intelligence and network security. Although quantum algorithms are initial signs of surpassing speed limits on complicated machine-learning tasks, they also represent a threat to the cryptography that underpins distributed AI infrastructures. This poll will give a broad picture of the future of quantum computing and AI cybersecurity. We methodically examine the sensitivity of the existing AI data pipelines to quantum attacks, in particular, the consequences of the algorithms of Shor and Grover. Moreover, we examine new solutions that have emerged after quantising, such as quantum key distribution (QKD) and quantum machine learning (QML), to improve anomaly detection. This paper fulfilled the objective of synthesising existing literature by highlighting key challenges that remain that need to be addressed and creating a future research agenda to ensure AI ecosystems are secured in the post-quantum world.

Paper ID:ICA6NT 739

Data Security Challenges and Solutions in Modern Cloud Computing Systems

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ABSTRACT

Cloud computing has emerged as a significant technological advancement worldwide, offering a comprehensive model that provides on-demand access to a shared pool of computing resources such as applications, servers, storage, networks, and services. Its advantages—including high performance, strong computational capability, cost-effectiveness, scalability, accessibility, and high availability—have increased its widespread adoption. This study focuses on the fundamental characteristics of cloud computing, along with the major threats and security challenges associated with it. Although cloud computing offers numerous benefits, data security remains a critical concern. Cryptography plays a vital role in protecting sensitive data stored on cloud database servers. In this work, we propose an enhanced approach based on the Advanced Encryption Standard (AES), which utilizes a 128-bit plaintext and a 128-bit key for both encryption and decryption to improve data security in cloud environments.

Keywords: Cloud computing, Cloud security, Security mechanisms, Security policies, Service models, Authorization, Advanced encryption, Data security, Encryption.

Paper ID:ICA6NT 744

Real-Time Intelligent Decision Making through Edge-Based Deep Reinforcement Learning

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ABSTRACT

The rapid expansion of Internet of Things (IoT) devices and smart technologies has led to massive volumes of continuously generated real-time data, exposing key limitations of cloud-centric processing such as high latency, increased bandwidth consumption, and delayed responsiveness in time-critical applications including autonomous vehicles, smart healthcare monitoring, industrial automation, and smart city infrastructure. This study aims to enable real-time intelligent decision making by integrating edge computing with Deep Reinforcement Learning (DRL), leveraging low-latency edge processing alongside adaptive, reward-driven policy learning. The proposed Edge-Based DRL framework collects data from IoT-enabled sources (e.g., sensors and cameras) at the edge layer, performs initial local processing on edge nodes, and deploys a DRL agent at the edge to observe system state, select actions, and iteratively improve decisions using rewards and penalties. As illustrated in Figure 1, the architecture is organized into three layers—Data Collection, Edge Processing, and Cloud—supporting rapid local analytics while retaining cloud support for broader functions. The framework was evaluated using latency, response time, resource utilization, and decision accuracy, demonstrating that edge-based processing reduces transmission time to remote servers, lowers network delay, and decreases bandwidth usage compared with traditional cloud-based approaches. Continuous DRL interaction improved decision policies over time, enabling effective adaptation to dynamic conditions and outperforming rule-based techniques in resource management. The model also dynamically allocates compute resources based on workload and system conditions, balancing load across edge devices and preventing overload. Overall, integrating edge computing with DRL provides a scalable and responsive paradigm for intelligent distributed systems, while acknowledging persisting edge-layer challenges such as resource constraints, training complexity, and security concerns.

Paper ID:ICA6NT 745

Smart Governance: Design of a Centralized Digital Platform for Public Grievance Redressal and Monitoring

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Guide Name: Ms. Harsha Kunwar

ABSTRACT

Smart governance plays a crucial role in improving the efficiency and transparency of public administration in modern cities. This paper presents the design of a **Centralized Digital Platform for Public Grievance Redressal and Monitoring**, which enables citizens to report civic issues through a unified digital system. The platform allows users to submit complaints related to sanitation, potholes, water leakage, traffic issues, and other municipal services. These complaints are automatically routed to the appropriate authorities through an administrative dashboard where officials can track, monitor, and resolve issues efficiently. The proposed system addresses challenges such as lack of transparency, fragmented reporting channels, and delayed response from authorities. By providing real-time tracking, centralized complaint management, and improved accountability, the platform enhances communication between citizens and government agencies, ultimately improving service delivery and public trust.

Paper ID:ICA6NT 746

AI-Powered Freshness Detection of Fruits and Vegetables Using Deep Learning Convolutional Neural Networks

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ABSTRACT

The rapid growth of the global food supply chain and increasing consumer demand for safe, high-quality produce have created an urgent need for automated and reliable freshness assessment methods. Traditional approaches — including manual visual inspection and laboratory-based chemical analysis — are inherently time-consuming, subjective, and unsuitable for large-scale commercial deployment. These limitations result in significant post-harvest food losses, economic inefficiencies, and public health risks. This paper proposes an AI-powered deep learning system for the automatic freshness detection of fruits and vegetables using Convolutional Neural Networks (CNN). The system classifies produce images as FRESH or NOT FRESH based on their visual characteristics. The CNN model is trained on a comprehensive dataset sourced from the Kaggle platform, comprising over 5,000 labelled images across seven categories: apples, bananas, tomatoes, cucumbers, oranges, potatoes, and okra. The architecture comprises three convolutional blocks with ReLU activation, MaxPooling layers, fully connected Dense layers with Dropout regularization, and a Sigmoid output neuron. Implemented entirely in Python using TensorFlow, Keras, and OpenCV, the system achieved a classification accuracy of 98.27%, precision of 98.02%, recall of 98.51%, and F1-Score of 98.26% on a 404-image test set, confirming its effectiveness as a non-destructive, scalable, and cost-effective solution for automated food quality management.

Keywords--- Freshness Detection, Convolutional Neural Network, Deep Learning, Image Classification, TensorFlow, OpenCV, Kaggle, Food Quality Assessment, Binary Classification, Artificial Intelligence

Paper ID: ICA6NT 747

Real-Time AI/ML-Based Phishing Detection and Prevention System Using Cyber Security

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ABSTRACT

As web-based services grow, cyber-adversaries increasingly exploit human vulnerabilities through phishing to harvest sensitive credentials and financial assets. Conventional security measures, which mostly rely on static blacklists and fixed rules, often fail to intercept modern, "zero-day" attacks. This study introduces an autonomous detection architecture that merges Machine Learning (ML) and Natural Language Processing (NLP) to evaluate suspicious communication and URLs in real time. By analyzing multidimensional features—including domain metadata and linguistic patterns—the system provides an instant safety assessment via a web interface. Our findings indicate that this AI-driven approach significantly improves detection precision while reducing the frequency of false alerts.

Keywords: Predictive Cyber Security, ML-Based Detection, Real-Time Threat Analysis, Phishing Prevention.

Paper ID:ICA6NT 750

KAG System for Complex Medical Query

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ABSTRACT

Large Language Models (LLMs) have demonstrated remarkable capabilities in natural language understanding, yet they frequently produce hallucinated or non-verifiable responses when applied to complex clinical queries. This limitation is particularly critical in the biomedical domain, where factual accuracy, interpretability, and evidence grounding are essential. To address this challenge, we propose a Knowledge-Augmented Generation (KAG) framework for complex medical query answering that constrains LLM reasoning using structured biomedical knowledge. Our approach transforms the PrimeKG precision medicine knowledge graph into a relation-aware textual corpus and retrieves supporting evidence through a hybrid retrieval pipeline that combines BM25 lexical scoring with Sentence Transformer dense embeddings. To improve recall and semantic coverage, the system performs dynamic query expansion using Gemini Flash, generating clinically relevant synonyms and variants of user queries. An intent detection module further refines retrieval by filtering evidence according to relevant knowledge graph relation types. Retrieved evidence is structured into (head, relation, tail) triples and injected into the reasoning context of the Gemini LLM through constrained prompt engineering, ensuring that generated answers are grounded exclusively in retrieved biomedical knowledge. To enhance transparency and reliability, we introduce a deterministic confidence scoring module that categorizes responses into reliability tiers based on multi-hop reasoning depth and retrieval relevance. The resulting system enables interpretable reasoning paths, knowledge-grounded responses, and improved factual consistency for complex biomedical queries. The framework is implemented as an end-to-end system with a FastAPI backend

and an interactive React interface supporting visualization of reasoning chains, knowledge graph entities, and response confidence levels. The experimental outcome proves that the proposed system is capable of efficiently enhancing the accuracy of medical query responses, thus providing an intelligent and effective solution for the current healthcare scenario.

Keywords— Knowledge-Augmented Generation (KAG), Medical Question Answering, Knowledge Graph, Natural Language Processing, Hybrid Retrieval, Biomedical Data

Paper ID:ICA6NT 751

Digital Mental Health and Psychological Support System for Students in Higher Education Using Python

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ABSTRACT

Mental health challenges among students in higher education institutions have increased significantly due to academic pressure, lifestyle changes, and social factors. Many students hesitate to seek psychological help because of stigma, lack of awareness, or limited access to counselling services. To address this issue, this research proposes a **Digital Mental Health and Psychological Support System** designed specifically for students.

The proposed system provides an online platform where students can assess their mental well-being using standardized questionnaires, receive AI-based guidance for coping strategies, and book confidential counselling appointments when required. The platform also includes a mental wellness resource hub that provides educational materials such as relaxation techniques, stress management guides, and mindfulness exercises.

Keywords:Digital Mental Health System, Student Mental Well-being, AI Chatbot Support, Psychological Assessment, Counselling Platform, Mental Health Analytics.

Paper ID:ICA6NT 752

ARTIFICIAL INTELLIGENCE &ML BASED SoC ESTIMATION FOR EV BATTERY

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ABSTRACT

As electric vehicles gain popularity in India, knowing the exact State of Charge of the battery is critical. This helps reduce range anxiety and makes these vehicles more practical for everyday use. Estimating the Battery remaining capacity accurately is vital for ensuring the safety, performance, and longevity of EVs. Traditional methods for estimation, such as Coulomb counting and open-circuit voltage techniques, often struggle due to measurement errors, temperature changes, and battery aging.

To address these issues, this project aims to develop an approach based on Artificial Intelligence (AI) and Machine Learning (ML) to estimate the SoC. By using data from real-time battery parameters like voltage and current, the ML model learns the complex relationship between these features and the actual SoC. The project explores techniques such as the Kalman Filter, Neural Networks, and Regression models to find the most effective algorithm. The goal is to improve estimation accuracy, reduce computational complexity, and increase flexibility in varying driving conditions. This intelligent estimation system will lead to better battery management and support the growth of sustainable electric mobility.

Paper ID:ICA6NT 753

HIRE ONLINE: AUTOMATING JOB APPLICATIONS USING RESUME ANALYZER

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ABSTRACT

The number of job applications for open positions has greatly increased due to the quick growth of digital recruiting procedures and online recruitment platforms. Although this expansion makes it easier for job searchers to find employment, it also generates a lot of irrelevant and underqualified applications, which makes it difficult to screen resumes effectively. Intelligent recruitment solutions that can assess a candidate's eligibility prior to application submission are required in this situation. In order to address this problem, this paper proposes an eligibility-based job application platform that incorporates Retrieval-Augmented Generation (RAG) for automated resume assessment. The system evaluates candidate resumes using resume parsing, information retrieval, and vector-based similarity approaches to find the most relevant resume parts for a particular job description. The collected resume information is evaluated to provide an resume score, which is then compared to the predefined eligibility criteria for each employment role. Based on this evaluation, the job application submission option is dynamically enabled or disabled. The proposed system increases application quality, reduces recruiter workload, and provides a scalable and understandable alternative to traditional job portals and applicant tracking systems.

Paper ID:ICA6NT 755

IoT Enable Smart System for Biowaste Management and Hazardous Gas Detection

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ABSTRACT

Proper management of bio-waste is essential, especially in hospitals and high-risk environments, to prevent infections and protect public health. The increasing amount of bio-waste and the release of harmful gases during decomposition highlight the need for smart and automated waste management solutions. This project presents an IoT-enabled smart system for bio-waste segregation and hazardous gas detection. The system uses gas sensors to monitor toxic gases released from decomposing waste and a webcam to capture real-time images of waste materials. Machine learning algorithms are used to classify the waste into infectious, non-infectious, and recyclable categories, ensuring safe and efficient disposal. The system also provides automated alerts when hazardous gas levels exceed safe limits. By reducing manual effort and improving monitoring efficiency, the proposed solution supports safer healthcare environments and promotes sustainable waste management practices.

Paper ID:ICA6NT 758

A Deep Learning Approach for Real-Time Cheating Detection in Online Examinations Using YOLOv8

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ABSTRACT

The rapid advancement of digital learning technologies has led to the widespread adoption of online education and remote examination systems across universities, certification bodies, and recruitment platforms. While online examinations provide flexibility and accessibility, ensuring fairness and maintaining academic integrity in remote environments remains a significant challenge due to the absence of physical invigilation. Traditional online proctoring approaches primarily rely on manual monitoring or screen activity tracking, which are often inefficient and unable to detect physical cheating activities occurring in the candidate's surroundings. To address this issue, this paper proposes a Smart AI-Based Online Exam Proctoring System that utilizes Artificial Intelligence and Computer Vision techniques for automated monitoring and real-time cheating detection. The proposed system integrates the YOLOv8 object detection algorithm with the OpenCV library to analyze live webcam feeds of candidates during examinations. Using a pre-trained model trained on the COCO dataset, the system detects unauthorized objects such as mobile phones, books, and laptops that may be used for malpractice. When suspicious objects are detected, the system automatically triggers alerts, captures snapshots, records short event-based video clips, and logs timestamps to generate verifiable evidence for administrative review. Experimental evaluation demonstrates that the proposed system achieves an object detection accuracy of approximately 94% with a response time of less than one second under different lighting conditions and environmental variations. The system provides an automated, scalable, and efficient solution for monitoring remote examinations while reducing reliance on manual invigilation. By integrating deep learning-based object detection with real-time video processing, the proposed approach significantly enhances the reliability, transparency, and integrity of online examination systems

Paper ID:ICA6NT 759

Detection Of Deep Faked Image Using Meso4 Architecture And Video Using LRCN Architecture

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ABSTRACT

The explosive development of artificial intelligence and deep learning has facilitated the development of very believable artificial multimedia materials, popularly known as deepfakes. These deepfakes can alter the appearance, expressions, and voice of individuals featured in images and videos. As a result, it is almost impossible for a human being to differentiate between deepfakes and authentic materials. Even as deepfake multimedia materials hold the potential to be utilized as a powerful tool in the creation of entertaining and educating multimedia materials, the misuse of deepfake multimedia materials has raised pertinent issues of the proliferation of misinformation, identity theft, and erosion of public trust in digital media. This work proposes a unified deepfake detection framework capable of analyzing both images and videos using dedicated deep learning architectures. For image-based detection, the Meso4 convolutional neural network is employed to capture spatial artifacts and facial inconsistencies commonly introduced during manipulation. For video-based detection, the Long-term Recurrent Convolutional Network (LRCN) is used to learn both spatial and temporal patterns across consecutive frames. The system also includes preprocessing, validation, and confidence estimation modules to improve detection reliability and usability. The proposed framework can be applied in digital forensics, cyber security, media verification, and social media monitoring, where identifying manipulated content is essential.

Keywords – Deepfake Detection, Meso4 CNN, LRCN, CNN-LSTM, Image Forensics, Video Forensics, Digital Media Authentication, Deep Learning.

Paper ID:ICA6NT 760

INTELLIGENT ROAD ACCIDENT DETECTION AND EMERGENCY RESPONSE SYSTEM USING IOT

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ABSTRACT

Road accidents are increasing every year and many lives are lost due to the delay in providing medical assistance. In many situations, victims are unable to inform emergency services immediately after an accident. To solve this problem, an IoT based vehicle accident detection and alert system is proposed.

The system uses sensors such as accelerometer and vibration sensors to detect sudden impacts or abnormal movements in a vehicle. When an accident occurs, the system automatically identifies the crash and obtains the exact location using a GPS module. The location information is then transmitted through an IoT communication network to emergency contacts, hospitals, or rescue teams.

This automated alert system helps reduce response time and ensures that medical assistance can reach the accident location quickly. The proposed system improves road safety and increases the chances of saving lives during critical situations.

Paper ID:ICA6NT 764

A Framework for Container Adoption in Government Research Infrastructure

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ABSTRACT

Government research organizations often rely on complex and heterogeneous IT infrastructures to support mission-critical applications and data-intensive workflows. Ensuring consistent deployment, scalability, and security across diverse computing environments remains a significant challenge for these institutions. Containerization has emerged as a practical solution by enabling standardized and portable application deployment across on-premises infrastructure, cloud platforms, and edge computing environments. This portability is particularly valuable for government research systems, where reliability, interoperability, and compliance with operational policies are essential. The growing adoption of container technologies in public-sector environments highlights the need for standardized approaches to deployment and management. The Open Container Initiative (OCI) provides widely accepted specifications that promote portability and compatibility of containerized applications across platforms and orchestration tools. This paper explores the fundamental concepts of containerization and examines the implementation of OCI-compliant container technologies within government research infrastructures. It provides an analytical overview of commonly used containerization tools and discusses their applicability in public-sector research environments. The insights presented aim to support government researchers, system architects, and IT administrators

in selecting appropriate container solutions to enhance operational efficiency, scalability, and reliability in research deployments.

Keywords—Container, Open Container Initiative, OCI, Docker, Research Infrastructure, Research Applications, Application Scalability, Interoperability, Isolation, Virtualization, Containerization, Software Deployment, Reproducibility

Paper ID:ICA6NT 766

High-Fidelity Semantic Communication via Residual-Corrected Generative Priors

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ABSTRACT

The transition from 5G to 6G networks demands a paradigm shift from Shannon-level bit transmission to semantic-level meaning transmission. While recent Generative AI approaches achieve ultra-low bandwidth by "hallucinating" realistic details, they suffer from low fidelity, often altering critical visual features. This paper proposes a Residual-Based Semantic Communication (ResSC) system that bridges the gap between perceptual quality and pixel accuracy. We utilize a pre-trained StyleGAN2 generator as a shared semantic knowledge base at the receiver. The sender transmits a compact latent code() alongside a sparse, entropy-coded residual map that corrects generative errors. Simulation results demonstrate that our method achieves an 87% reduction in file size compared to JPEG while maintaining superior structural similarity (SSIM), proving that hallucination can be controlled to serve fidelity. **Keywords:** Semantic Communication, 6G, Generative Adversarial Networks (GANs), Image Compression, Residual Coding

Paper ID:ICA6NT 770

EcoSecure

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ABSTRACT

EcoSecure is an intelligent, offline AI-powered system designed to protect farms and crops from unwanted animals. It's a smart device that automatically detects and repels different types of animals using a combination of sounds, lights, and vibrations—all without requiring internet. A camera with AI analyzes the image to identify which animal it is (bird, deer, elephant, wild boar, etc.) **Response** – Based on the animal detected, the system triggers targeted repellents: **Ultrasonic sounds** for birds and rodents **Predator growls** for deer **Dog barks + alarms** for wild boars **Bee swarm sounds** for elephants **Bright strobe lights** for nighttime deterrence **Water sprinklers or sirens** for dangerous animals

Keywords-ESP32-CAM,TensorFlow Lite (TFLite)Offline AI, Edge Impulse, OV2640 Camera, Image Classification

Paper ID:ICA6NT 772

Surface Defect Detection in Printed Circuit Board Using Lightweight Detection Algorithm

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ABSTRACT

The proposed two stage deep learning model for Printed Circuit Board (PCB) defect detection improves the identification of the defects on the micro-scale even by reducing the false alarm rates. The model starts with image standardization through Contrast Limited Adaptive Histogram Equalization (CLAHE) to enhance the local contrast. The proposed model includes an adaptive spatial processing technique to handle varying image size by up- sampling the images to a fixed size while overlapping tiles. The proposed defect detection model uses the YOLOv8n model with a addition P2 head to identify minute defects. The model is followed by a verification stage using a ResNet-18 classifier to remove false positives. The methodology stage uses a pixel to milli-meter calibration to measure the size of the defects. The proposed model also includes a Grad-CAM explainability model to visualize the decision making process. Experimental results show high recall and precision values.

Keywords: PCB defect, Two stage process, Heatmaps, Circuit Board

Paper ID:ICA6NT 775

A Comprehensive Review of Personalized Medical Recommendation Systems

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ABSTRACT

Mining potential and valuable medical knowledge from massive medical data to support clinical decision-making has become an important research field. Personalized medicine recommendation is an important research direction in this field, aiming to recommend the most suitable medicines for each patient according to the health status of the patient. Personalized medicine recommendation can assist clinicians to make clinical decisions and avoid the occurrence of medical abnormalities, so it has been widely concerned by many researchers. Based on this, this paper makes a comprehensive review of personalized medicine recommendation. Specifically, we first make clear the definition of personalized medicine recommendation problem; then, starting from the key theories and technologies, the personalized medicine recommendation algorithms proposed in recent years are systematically classified (medicine recommendation based on multi- disease, medicine recommendation with combination pattern, medicine recommendation with additional knowledge, and medicine recommendation based on feedback) and in-depth analyzed; and this paper also introduces how to evaluate personalized medicine recommendation algorithms and some common evaluation indicators; finally, the challenges of personalized medicine recommendation problem are put forward, and the future research direction and development trends are prospected.

Keywords – Recommended System; Clinical Decision Support; Medicine Recommendation

Paper ID:ICA6NT 776

A Systematic Review of Smart Water Safety and Drowning Prevention Technologies

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ABSTRACT

Drowning remains a critical global public health concern and often occurs silently, leaving very little time for rescue or intervention. In recent years, several smart water safety solutions have been proposed to reduce drowning risks through the use of Internet of Things (IoT) devices, wearable sensors, embedded systems, and automated alert mechanisms. These systems aim to improve swimmer safety by continuously monitoring physiological, environmental, and motion-related parameters and by issuing emergency notifications when abnormal conditions are detected. This paper presents a systematic review of smart water safety and drowning prevention technologies reported in recent literature. The review examines the sensing technologies, detection mechanisms, communication frameworks, and alert strategies used in existing systems. Particular attention is given to wearable safety devices, IoT-based monitoring models, threshold-based detection methods, and intelligent emergency response mechanisms. The study further compares the strengths and limitations of single-sensor and multi-sensor approaches in terms of detection accuracy, false alarm reduction, response time, and overall system dependability. The review reveals that although many existing systems provide basic monitoring and emergency alert support, a large number of them still rely on single-sensor architectures and simple threshold-based logic, which limit their robustness in real-

life aquatic environments. The analysis identifies major research gaps, including insufficient multi-parameter assessment, lack of contextual awareness, and limited real-time reliability. Based on these findings, the paper suggests that future drowning prevention systems should incorporate sensor fusion, intelligent decision-making models, and optimized communication strategies to achieve greater accuracy, faster response, and improved reliability.

Keywords: Drowning detection, water safety, IoT-based monitoring, wearable sensors, emergency alert systems, systematic review

Paper ID:ICA6NT 777

Smart Community Health Monitoring and Early Warning System

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ABSTRACT

Water-borne diseases remain a major public health concern in rural regions of Northeast India due to inadequate sanitation, unsafe drinking water, and limited healthcare accessibility. Traditional disease surveillance systems rely on delayed manual reporting, which results in late detection and ineffective response to outbreaks. This paper proposes a Smart Community Health Monitoring and Early Warning System that integrates Internet of Things (IoT) sensors, mobile health data collection, and machine learning techniques to provide real-time monitoring and early prediction of water-borne disease outbreaks. The proposed system continuously collects water quality parameters such as pH, turbidity, and temperature along with community health reports submitted by health workers. A centralized cloud-based platform processes this data and applies predictive analytics to identify abnormal patterns and generate early alerts. The system aims to reduce response time, enhance preventive healthcare, and support decision-making for health authorities. Experimental analysis indicates improved detection accuracy and timely alert dissemination compared to conventional surveillance methods.

Keywords: Water-borne Diseases, Health Monitoring System, IoT Sensors, Machine Learning, Early Warning System, Rural Healthcare, Predictive Analytics.

Paper ID:ICA6NT 778

Design of a Compact Multi-Notched UWB Circular Patch Antenna with Defected Ground Structure for IoT Wireless Devices

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ABSTRACT

Ultra-Wideband (UWB) technology is widely recognised as a key enabler for next-generation Internet of Things (IoT) applications due to its large bandwidth, low power consumption, and high data transmission capability. However, UWB systems coexist with several narrowband wireless services such as WiMAX, WLAN, and X-band satellite communication, which may cause severe electromagnetic interference. To address this issue, this paper presents the design and analysis of a compact multi-notched UWB circular patch antenna incorporating a defected ground structure (DGS). The proposed antenna operates over the UWB frequency range of 3.1–10.6 GHz while introducing multiple band-notched characteristics to suppress interference from coexisting wireless systems. The band-notched behaviour is achieved through slot loading on the circular radiating patch and an optimised DGS on the ground plane. The antenna is designed on a low-cost FR4 substrate and optimised using full-wave electromagnetic simulation software. Simulation results demonstrate wide impedance bandwidth, effective multi-band rejection, stable radiation patterns, and satisfactory gain performance, making the antenna suitable for compact IoT wireless devices.

Keywords: Ultra-Wideband (UWB), Circular Patch Antenna, Defected Ground Structure (DGS), Band-Notch, Internet of Things (IoT)

Paper ID:ICA6NT 779

Efficient Metasurface-Based Wireless Power Transfer System using TMS Antenna

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ABSTRACT

Wireless Power Transfer (WPT) enables energy transmission without physical connections, offering improved convenience and reliability. However, conventional WPT systems face challenges such as low efficiency, limited range, and electromagnetic power loss. This paper presents an Efficient Meta Surface-Based Wireless Power Transfer System using a Transmitting Meta surface (TMS) antenna to overcome these limitations. The proposed system utilizes a designed Meta surface to control and focus electromagnetic waves toward the receiving antenna, thereby enhancing power directivity and coupling efficiency. By optimizing the phase and amplitude distribution of the radiated fields, energy leakage is minimized and transfer efficiency is significantly improved compared to traditional antenna-based WPT systems. Simulation results validate the effectiveness of the TMS antenna in achieving higher efficiency and better alignment tolerance. The compact and scalable nature of the proposed system makes it suitable for applications such as wireless charging, biomedical devices, and Internet of Things (IoT) systems. This work demonstrates the potential of Meta surface-assisted antennas in advancing high-efficiency wireless power transfer technologies.

Keywords: Wireless Power Transfer (WPT), Meta surface, TMS antenna, Power Transfer Efficiency, Electromagnetic wave focusing, wireless charging

Paper ID:ICA6NT 781

A Machine Learning Based Multimodal Framework for continuous health monitoring using wearable and cough data

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ABSTRACT

The contemporary digital health environment features an abundance of applications and wearable technologies capable of monitoring a wide array of physiological parameters, including cardiac activity, energy expenditure, sleep architecture, stress levels, and critical vital signs such as ECG, SpO₂, and body temperature. However, specialized instruments, exemplified by LCM for respiratory symptom surveillance like cough, typically function in isolation from broader health tracking ecosystems. This technological proliferation has paradoxically created a significant lacuna in the integration of these disparate data sources into a cohesive, publicly accessible, and user-friendly platform. This paper presents a novel framework designed to address this challenge by employing Generative AI (GenAI) to synchronize data from discrete cough monitoring tools with wearable health device datasets. Through GenAI's capacity for multimodal data analysis, the system can discern intricate patterns and correlations between respiratory symptoms and other physiological metrics, thereby facilitating the early detection of nascent health conditions. The proposed solution is engineered to demystify health data interpretation for non-expert users by generating personalized, localized summaries and actionable insights. This integrated approach not only augments the accuracy of health assessments but also empowers

individuals to exercise informed agency over their well-being. The framework holds substantial promises for advancing chronic disease management, expediting illness detection, bolstering preventive care, and informing post-care decisions, fostering a unified, intelligent, adaptive, and accessible paradigm for health monitoring [21]

Keywords: Cough pattern analysis, Gen-AI Multimodal health data, Smart LCM cough monitoring, Smart health ecosystem, Human-centered health interfaces

Intelligent AI System for Skill Development, Interview Preparation, and Career Advancement

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ABSTRACT

The project “Intelligent AI System for Skill Development, Interview Preparation, and Career Advancement” is designed to help students and job seekers improve their professional skills, prepare for interviews, and build career growth pathways using Artificial Intelligence. The system provides personalized learning recommendations, mock interview practice, resume improvement suggestions, and career guidance based on the user’s skills, interests, and job goals. By integrating machine learning and AI-driven feedback, the platform supports continuous improvement and enhances employability.

Keywords

Artificial Intelligence (AI), Skill Development, Interview Preparation, Career Advancement, Personalized Learning, Machine Learning, Natural Language Processing (NLP), Mock Interview System, Resume Analysis, Career Recommendation, Employability Enhancement, Adaptive Learning Platform, Job Role Prediction, Intelligent Career Assistant, Progress Tracking.

Paper ID:ICA6NT 783

ECHOWATT: ELECTRICAL ENERGY GENERATION FROM HIGHWAY NOISE

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ABSTRACT

ECHOWATT proposes a sustainable method to generate electricity from highway noise and vibrations using a 4×4 array of 50 mm piezoelectric transducers. The harvested low-level AC is rectified using 1N5819 Schottky diodes and smoothed through capacitive filtering before being processed by an Arduino-based smart power management unit. The Arduino monitors voltage and current through an INA219 sensor and tracks temperature and humidity to analyse environmental effects on energy harvesting. A boost converter (XL6009) regulates the variable output for efficient battery storage, with adaptive control logic that bypasses conversion when sufficient voltage is available to improve efficiency. In addition to energy generation, the system performs intelligent analysis of vibration-based energy signatures for detecting traffic patterns. Overall, ECHOWATT provides a compact, scalable, and autonomous solution for renewable energy harvesting and smart highway infrastructure monitoring.

Index Terms— Piezoelectric energy harvesting, Highway noise energy, Acoustic energy conversion, Vibration-based power generation, Renewable energy systems, Bridge rectifier, Schottky diodes, DC-DC boost converter, Arduino-based control system, Smart power management, Environmental sensing, Traffic pattern analysis, Sustainable infrastructure, Low-power embedded systems, Energy storage systems.

Paper ID:ICA6NT 784

Gamified Environmental Education Platform for Schools and Colleges

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ABSTRACT

The growing need for environmental awareness among students has highlighted the importance of innovative and engaging learning methods. Traditional teaching approaches often fail to actively involve learners in sustainability practices. This paper proposes a Gamified Environmental Education Platform designed for schools and colleges, which integrates game-based learning, interactive challenges, and reward mechanisms to promote environmental responsibility. The platform leverages modern technologies such as mobile applications, real-time feedback systems, and data analytics to track student progress and encourage eco-friendly behavior. Features such as quizzes, missions, leaderboards, and community challenges enhance student participation and motivation. Experimental implementation results indicate improved student engagement, knowledge retention, and positive behavioral change towards environmental conservation compared to conventional learning methods. The proposed solution is scalable, user-friendly, and adaptable to various educational institutions aiming to promote sustainability education effectively.

Keywords: Gamified Learning, Environmental Education, Sustainability Awareness, Student Engagement, Eco-friendly Practices, Game-based Learning, Educational Technology, Schools and Colleges, Green Education Platform, Digital Learning Systems

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END-TO-END IOT SURVEILLANCE SYSTEM FOR HIGH-RISK CHEMICAL SHIPMENTS

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ABSTRACT

The transportation of high-risk and hazardous chemicals requires continuous monitoring to prevent accidents, environmental damage, and human casualties. Traditional shipment tracking systems focus mainly on vehicle location monitoring and lack integrated environmental safety surveillance. This paper proposes an end-to-end IoT-based surveillance system for high-risk chemical shipments that enables real-time monitoring of environmental and safety parameters throughout the transportation process. The system integrates gas sensors, temperature and humidity sensors, tamper detection modules, and GPS tracking into a microcontroller-based platform using ESP32. Sensor data is continuously processed and transmitted securely to a cloud-based monitoring system via GSM/Wi-Fi/LoRa communication. In case of abnormal conditions such as gas leakage, excessive temperature rise, unauthorized container access, or route deviation, instant alerts are generated through SMS, email, or mobile application notifications. The proposed system enhances safety, transparency, real-time decision-making, and regulatory compliance in hazardous material logistics. The architecture is scalable and suitable for industrial and large-scale deployment.

Index Terms— IoT, Chemical Shipment Monitoring, ESP32, GPS Tracking, Gas Leakage Detection, Cloud Monitoring, Hazardous Logistics.

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AI-Powered Framework: Permissioned Blockchain For Herb Traceability, Autonomous Verification, and Ecological Compliance of Ayurvedic Herbs Using Geo Intelligence and Digital Twins

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ABSTRACT

The global herbal medicine supply chain faces increasing challenges related to adulteration, quality degradation, regulatory non-compliance, and fraudulent labeling. Traditional verification methods rely heavily on manual inspections and laboratory testing, resulting in delayed validation, high operational costs, and limited scalability. This paper proposes a comprehensive Artificial Intelligence (AI)-driven framework for herbal product authentication, potency estimation, fraud detection, and geo-based compliance monitoring. The proposed system integrates deep learning-based image classification, temporal potency decay modelling, weighted authenticity scoring, blockchain-backed verification records, and a compliance geo-visualization dashboard for regulatory authorities. A modified ResNet18 architecture is employed for herbal species classification, and a confidence-weighted authenticity metric is computed using model prediction confidence and historical class accuracy. Potency degradation is modelled using a bounded linear decay function. The framework further introduces an auditor-restricted geo-map interface for real-time compliance visualization across regions. Experimental results demonstrate improved detection reliability, explainability, and regulatory transparency. The proposed architecture

contributes to digital governance in herbal supply chains and supports sustainable and trustworthy medicinal ecosystems.

Keywords: Artificial Intelligence, Deep Learning, Herbal Authentication, Supply Chain Transparency, Blockchain, Geo-Compliance Monitoring, Authenticity Scoring, Potency Modeling, Fraud Detection, ResNet18

Paper ID:ICA6NT 789

BlackBox AI: A Multimodal, Multi-Agent Framework for Adaptive Interview Preparation and Behavioral Skill Development

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ABSTRACT

Technical interview failure rates among engineering graduates remain alarmingly high, often attributable not to deficiencies in domain knowledge but to inadequate communication, weak behavioral presence, and insufficient real-world interview exposure. Existing preparation platforms such as LeetCode and HackerRank address algorithmic proficiency in isolation, neglecting the multimodal, socially dynamic nature of actual interview environments. This paper presents BlackBox AI, a novel full-stack interview preparation framework that integrates multimodal behavioral analysis, retrieval-augmented generation (RAG), multi-agent group discussion simulation, an AI-assisted Practice Hub, and gamified adaptive learning pathways into a unified, production-ready platform. The system leverages a Next.js 16 frontend with immersive Three.js 3D spatial interfaces, a Python FastAPI backend, Firebase authentication, and Prisma ORM. Core capabilities include a Real-Time Mock Interview Engine with live speech-to-text transcription, granular disfluency analysis covering filler-word detection, stammering frequency, and hesitation pattern scoring, AI-powered behavioral feedback (eye contact, posture, smile detection), and company-specific question generation for Google, Amazon, Microsoft, Apple, TCS, Accenture, and Deloitte. An AI-Assisted Practice Hub enables learners to seek real-time clarifications, request expanded explanations of model answers, and engage in open-ended doubt resolution through a conversational LLM interface. A

Context-Aware Project Interrogation Module allows users to upload project documentation (PDF/PPT), whereupon an RAG pipeline dynamically formulates architecture-level questions. A Multi-Agent Group Discussion Simulator presents four distinct AI personas with a polite-interruption scoring mechanism that rewards candidates who intervene constructively and contribute substantive points ahead of peers. Multimodal analytics dashboards track Fluency, Confidence, Technical Accuracy, Leadership, and Behavioral metrics over time. Comparative evaluation demonstrates statistically significant improvements in candidate confidence scores (32.4%), communication fluency (27.1%), and mock interview performance (41.7%). BlackBox AI represents a paradigmatic advancement in AI-driven human skill development, bridging the gap between technical competence and interview-ready presence.

Keywords: Multi-Agent Systems; Affective Computing; Large Language Models; Retrieval-Augmented Generation; Behavioral Analytics; Speech Recognition; Gamified Learning; Interview Preparation Platforms.

SpectraVein: An Orbital Mining Intelligence and Economic Feasibility Framework for Near-Earth Asteroid Classification Using Unsupervised Machine Learning

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ABSTRACT

The rapid growth of near-Earth object (NEO) catalogues and the emergence of space resource utilisation as a commercially viable frontier have created a pressing need for automated, scalable systems capable of classifying asteroids by composition and quantifying their economic mining potential. This paper presents SpectraVein, an orbital mining intelligence and economic feasibility engine that processes 802 near-Earth asteroids sourced from the NASA JPL Small-Body Database. The system applies K-Means unsupervised clustering ($k = 3$) on asteroid albedo values to assign spectral class labels – C-class (carbonaceous), S-class (silicaceous/stony-iron), and M-class (metallic) – without requiring spectroscopic observations. An eight-step physics and economics engine then derives per-asteroid estimates of mass, gross mineral valuation, market-shock adjusted value, orbital accessibility score, capital expenditure (CapEx), net projected profit, and environmental CO₂ offset from terrestrial mining avoidance. A dynamic CapEx recalculation module integrates live close-approach data retrieved from the NASA JPL Close-Approach Data (CAD) API, enabling launch-window-sensitive mission cost estimation in real time. The complete pipeline is exposed through a FastAPI backend and a Next.js 16 interactive intelligence dashboard featuring a live 3D Keplerian orbital orrery, a regulatory compliance enforcement engine grounded in the Artemis Accords and UN

planetary defense protocols, an ISRU mode for water-rich C-class targets, and an Explainable AI (XAI) layer that translates orbital science into executive-readable briefings. SpectraVein demonstrates that a hybrid of astrophysical domain knowledge, unsupervised machine learning, and real-time API integration can produce an end-to-end asteroid prioritisation system viable for research, mission planning, and commercial feasibility analysis.

Index Terms – Near-Earth Asteroids, Asteroid Classification, K-Means Clustering, Albedo-Based Spectral Taxonomy, Orbital Mining, Economic Feasibility, NASA JPL, FastAPI, Next.js, Explainable AI, Keplerian Mechanics, ISRU, Space Resource Utilisation

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INTELLIGENT IoT- BASED PREDICTIVE ENERGY OPTIMIZATION SYSTEM FOR SUSTAINABLE SMART BUILDINGS

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ABSTRACT

This project presents a smart energy management system that integrates IoT and Machine Learning to monitor, analyze, predict, and optimize energy consumption in buildings. Sensors measure parameters such as voltage, current, temperature, humidity, air quality, light intensity, and occupancy. The collected real-time data from a prototype building is transmitted via an ESP-based microcontroller to the ThingSpeak cloud platform for storage and monitoring. MATLAB is used to compute electrical parameters such as real, reactive, and apparent power, and to apply machine learning techniques for energy efficiency classification and short-term energy consumption prediction.

The system operates in a closed-loop configuration, where analytical and predictive results are used to generate control signals that automatically regulate lighting, ventilation, and cooling systems based on occupancy and environmental conditions. This approach ensures optimized energy utilization while maintaining indoor comfort. The proposed solution demonstrates a cost-effective and scalable framework for intelligent building energy management, contributing toward sustainable and energy-efficient smart infrastructure.

keywords: Smart Building, Energy Optimization, MATLAB, IoT, ESP32, ThingSpeak, ARIMA, Regression

Paper ID: ICA6NT 792

ENHANCING FETAL HEALTH PREDICTION USING MACHINE LEARNING TECHNIQUES

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ABSTRACT

Reducing preventable maternal and child deaths is an important goal set by the United Nations for 2030. Even today, many mothers and newborn babies die due to pregnancy-related problems. This shows that proper monitoring of the baby during pregnancy is very important. Cardiotocography (CTG) is a safe and non-invasive method used to monitor the baby's heart rate and the mother's uterine contractions. Doctors use CTG reports to check whether the baby is healthy or not. However, analyzing CTG reports manually depends on the doctor's experience. Different doctors may give different opinions, and sometimes this can lead to wrong decisions. So, there is a need for an automatic and reliable system to analyze and understand CTG data.

In 2017, more than 295,000 maternal deaths were recorded worldwide. Inspired by this serious issue, this study aims to improve fetal health prediction using machine learning techniques. In this project, a dataset with 2,126 CTG records and 21 medical features was used. Before applying machine learning models, the data was normalized and validated to improve performance and accuracy.

Different machine learning algorithms were applied in this study, such as Logistic Regression, Support Vector Machine (SVM), K-Nearest Neighbors (KNN), Random Forest, XGBoost, Blended Models, and a Stacked Ensemble model.

The results show that ensemble models perform better than individual models. The Stacked Ensemble model achieved the highest accuracy of 96.00%. XGBoost gave 95.88% accuracy. Traditional models like KNN, SVM, and Logistic Regression showed lower accuracy, ranging from 77.79% to 91.54%.

To make the system useful in real hospitals, a lightweight prediction system using an optimized Random Forest model with selected important features is also proposed. This enables the system faster and suitable for practical healthcare use.

Keywords: Cardiotocogram (CTG), Fetal Health Prediction, Machine Learning, Random Forest, XGBoost, Ensemble Models.

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