SRM INSTITUTE OF SCIENCE AND TECHNOLOGY
FACULTY OF SCIENCE AND HUMANITIES
KATTANKULATHUR CAMPUS

in association with

AIMST UNIVERSITY

ICTACADEMY

4th INTERNATIONAL CONFERENCE 2026

Computational Intelligence & Mathematical Applications

12.3.2026 & 13.3.2026 at AIMST UNIVERSITY, Malaysia

CONFERENCE PROCEEDINGS

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MESSAGE FROM THE PRO–VICE CHANCELLOR

In the present era of rapid technological transformation, advancements in computational intelligence, artificial intelligence, data analytics, and mathematical modeling have significantly influenced diverse sectors including healthcare, engineering, finance, and smart technologies. Academic conferences such as CIMA play a crucial role in bringing together researchers and practitioners from across the globe to share innovative ideas, discuss contemporary challenges, and explore interdisciplinary research opportunities. By fostering dialogue between academia and industry, this conference aims to stimulate impactful research that contributes to both technological progress and societal development.

The hybrid format of the Fourth International Conference on Computational Intelligence and Mathematical Applications (CIMA'26) organized by our three departments - Computer Applications, Computer Science , Mathematics and Statistics of Faculty of Science and Humanities , SRM Institute of Science and Technology serves as an important international platform for scholarly exchange and collaboration in emerging areas of computational intelligence and mathematical sciences.

CIMA 2026, hosted at AIMST University, Malaysia on 12–13 March 2026, in collaboration with AIMST University, Malaysia, UKM University, Malaysia, and ICT Academy reflects our commitment to promoting global academic participation and collaborative research. The computational intelligence continues to evolve and transforming industries, from artificial intelligence and data science to engineering and healthcare. This conference, through insightful keynote addresses, technical sessions, and paper presentations, aims to ignite discussions that will shape the future of these fields.

I commend the organizers, advisory committees, and participants for their dedication to advancing knowledge and fostering meaningful academic discourse.

I am confident that the proceedings of CIMA'26 will provide valuable insights, inspire future research, and strengthen collaborative networks among scholars and professionals working in the domains of computational intelligence and mathematical applications.

Wishing you a successful and enriching conference experience!

Dr. DURAISAMY A
Dean, Faculty of Science and Humanities,
SRM Institute of Science and Technology.
Kattankulathur, Chennai, India

MESSAGE FROM THE DEAN

In today's digital era, advancements in artificial intelligence, data analytics, and computational modeling are transforming scientific research and technological innovation. These areas play a key role in solving complex problems in healthcare, engineering, finance, and intelligent systems. Conferences such as CIMA provide an important platform for sharing knowledge and interdisciplinary research among scholars worldwide.

It gives me great pleasure to note that the Faculty of Science and Humanities, SRM Institute of Science and Technology, Kattankulathur, is organizing the Fourth International Conference on Computational Intelligence and Mathematical Applications (CIMA'26). The conference will be held in hybrid mode and hosted at AIMST University, Malaysia, on 12–13 March 2026, with the aim of promoting international participation and academic collaboration. The conference is organized by the Departments of Computer Applications, Computer Science, and Mathematics and Statistics in collaboration with AIMST University, Malaysia, UKM University, Malaysia, and ICT Academy.

The conference will feature keynote lectures and technical sessions focusing on current challenges and future directions in computational intelligence and mathematical applications. It will also contribute to strengthening research culture among faculty members, scholars, and students while enhancing global academic partnerships.

I commend the efforts of the organizing team and congratulate the authors and participants for their valuable contributions. I wish CIMA'26 every success and hope that the deliberations will lead to new ideas, collaborations, and future research initiatives.

Dr. ALBERT ANTONY RAJ
Deputy Dean, Faculty of Science and Humanities,
SRM Institute of Science and Technology.
Kattankulathur, Chennai, India

MESSAGE FROM THE DEPUTY DEAN

It is with profound optimism and intellectual excitement that I extend my greetings to the distinguished scholars, innovators, and thought leaders gathered for the International Conference on Computational Intelligence and Mathematical Applications (CIMA'26).

We stand at a defining moment in human history—where algorithms influence economies, data shapes decisions, and intelligent systems redefine industries overnight. Yet, as computational power expands, so does our responsibility. The future of technology must not only be intelligent; it must be sustainable.

Computational intelligence and mathematical sciences are no longer confined to theoretical exploration—they are the architects of resilient societies. Through advanced optimization, predictive analytics, adaptive learning systems, and complex modeling, we possess the tools to address some of the planet's most pressing challenges: climate change, energy inefficiency, resource scarcity, and sustainable urbanization.

Sustainable computing emerges as a transformative paradigm within this context. It challenges us to design energy-efficient algorithms, develop low-carbon AI models, optimize cloud and edge infrastructures, and integrate renewable-aware computational strategies. Mathematics provides the language of precision; computational intelligence provides the engine of innovation. Together, they form the foundation of a sustainable digital civilization.

The research presented at this conference has the potential to go beyond incremental progress. It can redefine efficiency standards, reshape digital ecosystems, and create intelligent systems that are environmentally responsible, economically viable, and socially equitable. From green AI and smart grid optimization to sustainable data analytics and resource-aware architectures, our work can directly influence how future generations experience technology.

Let this conference be more than a platform for publication—let it be a catalyst for global collaboration, interdisciplinary thinking, and bold innovation. Let it ignite ideas that not only solve equations but also solve environmental challenges. Let it inspire research that measures success not only by accuracy and speed, but by impact and sustainability.

As we deliberate, debate, and discover, may we collectively commit to advancing computational intelligence that serves humanity responsibly and preserves our planet consciously.

May this conference inspire meaningful collaborations, transformative ideas, and research excellence that contributes to a smarter and more sustainable future.

I wish this conference immense success and enduring global impact.

YBHG. TAN SRI DATO' SRI DR. SA. VIGNESWARAN
Chancellor and Chairman,
AIMST University

It gives me immense pleasure to extend my appreciation to the Faculty of Engineering & Computer Technology (FECT), AIMST University, in collaboration with SRM Institute of Science and Technology, India, for organizing the 4th International Conference on Computational Intelligence and Mathematical Applications (CIMA'26).

This remarkable initiative underscores the pivotal role of research, collaboration, and innovation in advancing academic excellence and driving industrial transformation.
CIMA'26 serves as a transformative platform where scholars, researchers, industry professionals, and students can engage in meaningful intellectual discourse and explore innovative solutions to contemporary academic and industrial challenges. By fostering interdisciplinary collaboration and knowledge exchange, this conference strengthens academic frameworks that are aligned with industry expectations while nurturing future-ready graduates.

I commend the organizers, participants, and contributors for their unwavering commitment and dedication in making this conference a significant milestone. Their collective efforts in promoting cutting-edge research and cultivating global academic and industrial partnerships will undoubtedly create a lasting impact on education, innovation, and sustainable development.

AIMST University is honored to support and celebrate such forward-looking initiatives. We look forward to strengthening our collaborative engagements and continuing our shared mission of shaping the future of knowledge, research excellence, and responsible technological advancement.

My appreciation and Best Wish.

Chairman and Chancellor
AIMST University

Congratulatory Message from the Desk of the Vice-Chancellor,
AIMST University Malaysia

It is with immense pleasure that I extend my heartfelt congratulations to AIMST University, in collaboration with SRM Institute of Science and Technology, India, and ICT Academy for organizing the 4th International Conference on Computational Intelligence and mathematical Applications (CIMA'26).

This conference provides an invaluable platform for researchers, academicians, industry experts, and thought leaders to engage in insightful discussions, share pioneering research, and explore the expanding frontiers of Computational Intelligence and Mathematical Applications.

In today's data-driven and technology-oriented era, mathematical modeling, optimization techniques, statistical analysis, and intelligent computational frameworks form the backbone of innovation across disciplines. CIMA'26 highlights the critical integration of mathematical theories with advanced computational methodologies to solve complex real-world problems.

The diverse range of research presentations, keynote addresses, and panel discussions will illuminate emerging developments in areas such as intelligent systems, optimization algorithms, data analytics, applied mathematics, modeling and simulation, operations research, and interdisciplinary computational solutions. I encourage all participants to leverage this opportunity to foster interdisciplinary collaborations, exchange transformative ideas, and contribute meaningfully to the advancement of both computational intelligence and applied mathematics.

I extend my sincere appreciation to all organizers, presenters, reviewers, sponsors, and participants for their unwavering commitment and dedication to advancing AI research and its applications. Your collective contributions will not only enrich academic discourse but also drive impactful advancements in this ever-evolving field.
I wish CIMA'26 great success and am confident that this conference will leave a lasting impact on all participants, inspiring new ideas and fostering meaningful collaborations.

Best wishes for a fruitful and inspiring conference!
Sincerely.
Prof. ChM. Dr. Kathiresan V.Sathasivam FMIC

Message from Dr.KIRAN REDDY MEKA
Chief Operating Officer (COO) & Academic Advisor
AIMST University Malaysia

On behalf of AIMST University, I extend my sincere appreciation to Faculty of Engineering & Computer Technology (FECT) AIMST University & SRM Institute of Science and Technology, Kattankulathur,India for organizing the joint International Conference on Emerging Innovative Research with Industry 5.0 Technology, Engineering, Management, and Social Sciences (ICE 5.0 ITEMS). This initiative plays a pivotal role in advancing research, strengthening collaborations, and optimizing academic curricula to meet the demands of the evolving global landscape. The synergy between academia and industry is crucial in shaping the next generation of professionals and scholars. By embracing the latest research trends and integrating them into educational frameworks, we ensure that students and researchers remain at the forefront of innovation. This conference provides an invaluable opportunity to explore new paradigms of knowledge and practice, fostering interdisciplinary discussions that contribute to sustainable progress. We commend the efforts of SRM Institute in creating a space where thought leaders, educators, and industry professionals can come together to exchange ideas and develop actionable strategies. Your dedication to academic excellence and transformative research is truly commendable.
We look forward to future collaborations that will continue to drive impactful research and educational advancements.

Congratulatory Message from the Desk of the Registrar,
AIMST University Malaysia

On behalf of the Board of Directors and the Management of AIMST University, I extend my heartfelt congratulations to SRM Institute of Science and Technology, Kattankulathur, Chennai, India, and ICT Academy, Tamil Nadu, for their valued partnership in organizing the 4th International Conference on Computational Intelligence & Mathematical Applications (CIMA’26).

It is indeed a privilege for AIMST University to host this prestigious international conference, which serves as a dynamic global platform for knowledge exchange, collaboration, and innovation in the fields of Computational Intelligence, Artificial Intelligence (AI), Machine Learning (ML), and Mathematical Applications. CIMA’26 brings together distinguished researchers, academicians, industry professionals, and scholars to deliberate on emerging trends and transformative technological advancements. By fostering interdisciplinary dialogue and promoting research-driven solutions, this conference contributes meaningfully toward addressing real-world challenges and advancing ethical, sustainable, and intelligent technological development.

I extend my sincere appreciation to the organizing committee, keynote speakers, reviewers, and paper presenters for their dedication and scholarly contributions. May CIMA’26 inspire insightful discussions, stimulate groundbreaking ideas, and establish enduring professional networks among participants.
Wishing all delegates a successful, enriching, and impactful CIMA’26.

MS. KUNG LAY KHENG

Registrar AIMST University

DR. P.J. ARUL LEENA ROSE
Head of the Department
Department of Computer Applications
Faculty of Science and Humanities,
SRM Institute of Science and Technology.
Kattankulathur, Chennai, India

MESSAGE FROM HOD - COMPUTER APPLICATIONS

As we reflect on the progress and achievements of the past months, I am truly inspired by the passion and determination that define our department's research community. Each researcher, through curiosity, discipline, and dedication to excellence, contributes to an environment where innovation does more than flourish—it leads the way toward meaningful advancement.

Our department continues to grow as a hub of impactful research, where new ideas are nurtured and bold questions become the starting point for meaningful discovery. The contributions presented in this conference represent a wide spectrum of research efforts that expand theoretical knowledge, shape emerging technologies, support societal development, and address contemporary global challenges.

I am particularly encouraged by the collaborations that have emerged among researchers, across disciplines, and beyond institutional boundaries. Our Collaboration with AIMST University, Malaysia, is a testament to the importance of international academic cooperation. Such collaborations strengthen the quality, relevance, and global reach of our research contributions.

As we move forward, let us continue to uphold the spirit of inquiry that has brought us this far. Let us celebrate achievements, learn from every challenge, and remain motivated by the positive impact our work can create. Together, we will continue to build a department recognized not only for academic excellence but also for integrity, creativity, and a deep commitment to society.

I extend my sincere appreciation to the organizing committee, collaborators, authors, reviewers, and participants who have contributed to the success of CIMA 2026.

Thank you for your dedication, perseverance, and commitment to advancing knowledge.

DR. MUTHULAKSHMI P
Head of the Department
Department of Computer Science
Faculty of Science and Humanities,
SRM Institute of Science and Technology.
Kattankulathur, Chennai, India

MESSAGE FROM HOD - COMPUTER SCIENCE

I wish the International Conference on Computational Intelligence and Mathematical Applications – CIMA 2026 a great success and to follow many more versions in the years to come

The intersection of computational intelligence and mathematics has become a critical engine for innovation. As real-world problems grow in complexity, conventional modeling has its very own limitations, requiring nature-inspired methodologies, intelligent algorithms, and robust mathematical foundations to solve, optimize, and predict. This conference serves as a premier interdisciplinary platform for researchers, academicians, and industry professionals to exchange ideas, share insights, and foster collaboration in these dynamic fields.

DR. L. SIVAKAMI
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MESSAGE FROM HOD - MATHEMATICS & STATISTICS

It gives me great pleasure to extend my warm greetings and best wishes to all the speakers, participants, and delegates of the Fourth International Conference on Computational Intelligence and Mathematical Applications (CIMA'26).

On behalf of the Department of Mathematics and Statistics, I sincerely appreciate the dedicated efforts of the organizing committee, faculty members, research scholars, and students who have worked tirelessly to make this conference possible. Such academic gatherings provide an excellent platform for researchers, academicians, and industry experts to share innovative ideas, exchange knowledge, and discuss recent advancements in computational intelligence and mathematical applications.

I wish the conference great success and hope that all the sessions proceed smoothly and productively. May this event foster meaningful discussions, inspire new collaborations, and contribute significantly to the advancement of research and innovation.

I extend my best wishes to everyone involved for a successful and smoothly conducted conference..

LIST OF ABSTRACTS

DESIGNED FOR DYNAMIC NETWORKS: ADAPTIVE BACKPRESSURE ROUTING

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Abstract: Backpressure routing is a gating, dynamic, and adaptive congestion-control mechanism efficiently using as much of the channel bandwidth to maximize throughput in communication networks. Instead of forwarding packets on predetermined paths or multiple paths with static metrics, backpressure routing makes its decision based upon the current differences in queue length between neighboring nodes. By routing data along the paths to nodes with lower levels of congestion, without any global network knowledge, this is an effective traffic balancing algorithm that prevents bottlenecks as well. Coming from the theoretical Lyapunov optimization approach, it guarantees throughput optimality and queue stability as long as the traffic load is below network capacity. Despite potentially greater latency and memory overhead stemming from the maintenance of per-destination queues, the approach is practical with various improvements. Backpressure routing, widely deployed in diverse wireless mobile and distributed network environments, is still a prime candidate as the foundation for resilient scalable and efficient data transmission in modern dynamic systems.

Keywords: Adaptive Backpressure Routing; Dynamic Networks; Congestion Control; Lyapunov Optimization; Throughput Optimality.

PREDICTING CDOM CONCENTRATIONS FROM SPECTRAL REFLECTANCE DATA USING RANDOM FOREST FOR WATER QUALITY MONITORING

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Abstract: Monitoring water quality is essential for understanding environmental changes and maintaining healthy aquatic ecosystems. One important indicator of water quality is Chromophore Dissolved Organic Matter (CDOM), an organic substance present in natural water bodies that affects the colour and light absorption properties of water. Traditionally, measuring CDOM requires expensive and time-consuming laboratory analysis, while laboratory-measured organic matter concentrations serve as the target variables. Prior to model development, the dataset was carefully pre-processed by removing null values and measurement errors to ensure that the model learned from reliable and high-quality information. Since raw spectral data can contain noise and variability caused by external factors such as sunlight intensity and brightness, spectral ratio transformations were applied by dividing one wavelength by another. This normalization technique reduces external interference and highlights the underlying chemical relationship between light reflectance and organic matter concentration. As a result, the Pearson correlation between predictors and target variables increased, making it easier for the Random Forest model to identify meaningful patterns. The Random Forest regression model successfully captured the nonlinear relationship between spectral features and CDOM concentration, producing highly accurate predictions. Model evaluation using an Actual vs. Predicted plot showed data points clustering closely around the diagonal line, indicating strong agreement between predicted and observed values with an R^2 value close to 1. Feature importance analysis confirmed that the engineered spectral ratios played a significant role in improving prediction performance. Additionally, residual analysis showed that the prediction errors were randomly distributed, confirming that the model is unbiased and maintains a small error margin. Although this project was conducted using a static dataset, the results demonstrate strong potential for large-scale applications. The proposed approach could be extended to satellite imagery, effectively transforming satellites into global water quality monitoring systems capable of tracking pollution and climate-related changes in real time.

Keywords: Machine Learning, Random Forest Regression, CDOM Prediction, Spectral Reflectance, Water Quality Monitoring, Artificial Intelligence.

PREDICTING CHLOROPHYLL-A CONCENTRATIONS FROM OLCI SATELLITE DATA: A MACHINE LEARNING APPROACH FOR WATER QUALITY MONITORING

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Abstract: Monitoring water quality in aquatic ecosystems is vital for environmental sustainability, yet traditional sampling is often labour-intensive and geographically limited. This study proposes an automated framework for estimating Chlorophyll-a (CHL_a) concentrations using Ocean and Land Colour Instrument (OLCI) satellite data. By leveraging a Random Forest Regression model, the system maps complex, non-linear relationships between satellite reflectance bands and actual pigment concentrations. To ensure high predictive accuracy, the data undergoes log-transformation and rigorous pre-processing to handle the high dynamic range of aquatic bio-optical properties. The model was trained and validated using an 80/20 split, achieving significant performance as measured by R-squared (R^2), Root Mean Square Error (RMSE), and Bias. Experimental results demonstrate that the Random Forest approach effectively mitigates the "atmospheric noise" typical in satellite imagery, providing a scalable and cost-effective alternative to physical water sampling. This digital monitoring tool enables real-time detection of algal blooms and supports data-driven decision-making for marine resource management in economically and ecologically sensitive coastal regions.

Keywords: Remote Sensing, OLCI Data, Random Forest Regression, Chlorophyll-a Prediction, Water Quality Monitoring, Machine Learning.

IOT-BASED SMART IRRIGATION SYSTEM FOR AUTOMATED WATER RESOURCE MANAGEMENT IN PRECISION AGRICULTURE

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Abstract: Efficient irrigation management is essential for improving agricultural productivity and sustainable utilization of water resources in modern farming practices. This paper presents an IoT-based smart irrigation system designed to automate irrigation processes using real-time environmental monitoring and cloud-based supervision. The proposed system integrates a capacitive soil moisture sensor, DHT11 temperature-humidity sensor, and ESP32 microcontroller to continuously monitor agricultural field conditions and dynamically determine irrigation requirements based on predefined threshold values. The system was experimentally evaluated in a controlled laboratory soil environment over a period of five days using automated irrigation cycles. Experimental results indicate that the proposed system maintained soil moisture within the desired range of 40% ± 3% and achieved approximately 32% reduction in water usage compared to manual irrigation practices. The average response time recorded between soil moisture detection and pump activation was 2.3 seconds. The automated irrigation mechanism significantly reduces manual intervention while improving water usage efficiency and operational reliability under varying soil conditions.

Keywords: IoT-based Smart Irrigation, Precision Agriculture, Soil Moisture Monitoring, ESP32 Microcontroller, Automated Irrigation, Water Resource Management.

SMART SOIL NUTRIENT ANALYSIS AND CROP RECOMMENDATION SYSTEM USING MACHINE LEARNING

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ABSTRACT— Soil fertility assessments and good nutrient management are key factors to sustainable agricultural production. Unfortunately, traditional ways of testing soil use laboratory techniques; they are often costly and take a long time to test soil, making it impractical to monitor soil consistently in rural farming areas. To solve these issues, the current study proposes a new Artificial Intelligence of Things based framework (which includes real-time sensing and data-driven predictive analytics) for intelligent soil analysis and crop recommendations. This framework uses embedded soil sensors to measure critical agronomic parameters such as macronutrients (N, P, K), pH, moisture, and temperature, and sends this information to a cloud-based platform for preprocessing, feature engineering, and model training. The framework employs multiple machine learning algorithms which will be compared against one another to determine which will be the most effective model for providing accurate crop recommendations. This framework provides automated decision support, improves accuracy of predictions through an ensemble learning technique, and reduces reliance on human decision-making.

KEYWORDS: Ensemble learning technique, Soil Nutrient Analysis, Crop Recommendation, Precision Agriculture, Smart Farming.

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ABSTRACT— Soil fertility assessments and good nutrient management are key factors to sustainable agricultural production. Unfortunately, traditional ways of testing soil use laboratory techniques; they are often costly and take a long time to test soil, making it impractical to monitor soil consistently in rural farming areas. To solve these issues, the current study proposes a new Artificial Intelligence of Things based framework (which includes real-time sensing and data-driven predictive analytics) for intelligent soil analysis and crop recommendations. This framework uses embedded soil sensors to measure critical agronomic parameters such as macronutrients (N, P, K), pH, moisture, and temperature, and sends this information to a cloud-based platform for preprocessing, feature engineering, and model training. The framework employs multiple machine learning algorithms which will be compared against one another to determine which will be the most effective model for providing accurate crop recommendations. This framework provides automated decision support, improves accuracy of predictions through an ensemble learning technique, and reduces reliance on human decision-making.

KEYWORDS: Ensemble learning technique, Soil Nutrient Analysis, Crop Recommendation, Precision Agriculture, Smart Farming.

PREPROCESSING AND FEATURE EXTRACTION FOR BOTNET DETECTION IN IOT DEVICES USING SMOTE-NEURAL NETWORK

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ABSTRACT— — The Morden technical era is not fulfilled without the integration of automated system in many healthcare appliances, home appliances and many industrial machines. The internet of Things (IoT) plays a major role in connecting the hardware components of the system with the generated system software models to reduce the work load. The developed models vary according to the basic needs of peoples who eventually uses the model. Some cases the developed IoT based model needs less devises to complete the automated task, in some cases the developed models are in need to have multiple devises connection together for processing the task, which may create some security threats in botnets. Addressing such threats remains challenging in many cases; however, this can be mitigated by incorporating Neural Networking methodologies into IoT models. The developed technologies can give a proper solution for detecting the Botnet attack very effectively. This research article gives a clear idea about the preprocessing and feature extraction procedure followed before implementing the quantum neural network technology to detect the Botner attacks. This article also gives a demonstration of basic neural network algorithms in preprocessing stages. The potential approach in neural network involvement in the IoT Botnet attacks detection gives a value to improve the IoT security aspect.

KEYWORDS: Botnet, Malware, Neural Network, ANN, SMOTE

ANALYSIS OF DUFOUR-DRIVEN HEAT AND MASS TRANSFER IN MHD CASSON MULTIFLUID FLOW WITH THERMAL RADIATION

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ABSTRACT— — The This study investigates the combined influence of the Dufour effect and thermal radiation on magnetohydrodynamic (MHD) Casson multifluid flow in the presence of a homogeneous chemical reaction. The electrically conducting, non-Newtonian fluid is considered over a vertical surface with coupled heat and mass transfer effects. The governing nonlinear equations, incorporating magnetic field, radiative heat flux, concentration-induced heat transport, and reactive solutal diffusion, are non-dimensionalized and solved using a regular perturbation technique. Analytical solutions for velocity, temperature, and concentration fields are obtained. The formulation accounts for the influence of the Casson parameter, chemical reaction parameter, thermal radiation, and Dufour effect on the transport characteristics of the flow. The obtained solutions will be graphically analyzed using MATLAB to study parametric effects on momentum, thermal, and concentration distributions. The study provides theoretical understanding relevant to reactive radiative MHD flows in polymer processing, petroleum systems, and industrial heat- and mass-transfer applications..

KEYWORDS: Casson, Multifluid, Dufour, MHD, Perturbation

ANALYSIS OF DUFOUR-DRIVEN HEAT AND MASS TRANSFER IN MHD CASSON MULTIFLUID FLOW WITH THERMAL RADIATION

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ABSTRACT— — The This study investigates the combined influence of the Dufour effect and thermal radiation on magnetohydrodynamic (MHD) Casson multifluid flow in the presence of a homogeneous chemical reaction. The electrically conducting, non-Newtonian fluid is considered over a vertical surface with coupled heat and mass transfer effects. The governing nonlinear equations, incorporating magnetic field, radiative heat flux, concentration-induced heat transport, and reactive solutal diffusion, are non-dimensionalized and solved using a regular perturbation technique. Analytical solutions for velocity, temperature, and concentration fields are obtained. The formulation accounts for the influence of the Casson parameter, chemical reaction parameter, thermal radiation, and Dufour effect on the transport characteristics of the flow. The obtained solutions will be graphically analyzed using MATLAB to study parametric effects on momentum, thermal, and concentration distributions. The study provides theoretical understanding relevant to reactive radiative MHD flows in polymer processing, petroleum systems, and industrial heat- and mass-transfer applications..

KEYWORDS: Casson, Multifluid, Dufour, MHD, Perturbation

SPORTSMAN SPONSORSHIP PORTAL A DECENTRALIZED RESOURCE ALLOCATION AND INJURY RISK MITIGATION SYSTEM FOR UNDERREPRESENTED ATHLETES

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Abstract: The professional sports ecosystem faces a significant "Funding-Performance Gap," where high-potential, low-profile athletes struggle to secure financial backing due to high agency commission fees and the lack of social visibility. Furthermore, the absence of financial safety nets for sports-related injuries often leads to the premature termination of athletic careers. This paper proposes the **Sportsman Sponsorship Portal**, a commission-free, React-based digital framework designed to democratize athlete sponsorship and automate injury relief funds. The system utilizes a **Tiered Support Architecture** to facilitate direct, frictionless transactions between athletes and diverse sponsors, ranging from individual supporters to corporate entities. To ensure mathematical reliability and trust, the portal implements a **Credential Verification Engine**, allowing athletes to upload verifiable achievement certificates which are indexed and displayed for sponsor evaluation. Innovatively, the platform incorporates a **Real-time Injury Fund (RIF) Module**. This module utilizes a crowd-sourced contribution logic to maintain a liquid emergency fund, accessible to athletes upon the submission of medical documentation. By removing the traditional 15-20% intermediary commission, the system ensures 100% resource efficiency. Experimental results from the pilot deployment indicate that the portal significantly reduces the "Time-to-Sponsorship" for grassroots players while providing a sustainable insurance-like mechanism for physical recovery. The platform's low-overhead design makes digital sports management accessible to athletes in economically disadvantaged regions.

Keywords: Web Engineering, React Framework, Social FinTech, Zero-Commission Models, Resource Allocation, Injury Mitigation Systems.

A CROSS-RAIL POLICY DSL AND DETERMINISTIC RUNTIME VERIFIER FOR SECURE DELEGATED AGENTIC PAYMENTS

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DR. S. KANCHANA

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Abstract:- Autonomous AI agents are becoming increasingly capable of completing transactions on behalf of users. However, without real-time enforcement of user-defined regulations, such systems are prone to risks including excessive spending, merchant fraud, subscription abuse, and inconsistent policy application across payment channels This paper introduces a domain specific language (DSL), termed Crossrail Policy, along with a deterministic runtime verifier designed to securely enforce delegated spending policies in agentic commerce. The DSL allows users to define clear constraints such as spending quotas, vendor and category restrictions, time frames, and approval requirements. The verifier ensures compliance across multiple payment channels such as simulated card-based tokens and HTTP 402 micropayments by producing deterministic runtime decisions rather than relying on probabilistic AI based reasoning. The system is implemented and tested under adversarial conditions, demonstrating high policy compliance with low latency. This solution offers a scalable and secure control-plane architecture for policy-governed agentic payments.

Keywords:- *Agentic payments, delegated spending, domain-specific language (DSL), runtime policy enforcement, AI agents, payment rails, HTTP 402, secure transactions, cross-rail systems, deterministic verification.*

LOCATION BASED REMAINDER APPLICATION USING GEOFENCING

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Abstract: In today's fast-paced and highly mobile lifestyle, individuals often forget important tasks due to busy schedules and dynamic movement between locations. Traditional reminder systems are primarily time-based and may trigger alerts at inappropriate or inconvenient moments. To overcome this limitation, this project proposes an Android-based Location Based Reminder Application that delivers intelligent alerts based on the user's geographical position. The core objective of this project is to implement geo fencing technology to detect when a user enters a predefined geographic area and automatically trigger relevant reminders. The system leverages GPS and Google Maps API to monitor location boundaries efficiently while optimizing battery consumption. Reminder data, including task details, location coordinates, and radius settings, is stored locally using SQLite to ensure offline functionality and reliable performance even without continuous internet connectivity. The application is designed and developed using Android Studio and Java, integrating Android SDK components for background location tracking and notification management. The system architecture ensures accurate detection, efficient data handling, and smooth user interaction. By introducing context-aware alerting, the proposed system enhances task management, reduces missed activities, and improves overall productivity. Ultimately, this project demonstrates the effectiveness of location-aware computing in everyday applications and provides a scalable framework that can be extended with cloud synchronization, intelligent reminder suggestions, and cross-device integration in future developments. The system continuously monitors the user's location in the background using optimized location services to minimize battery consumption. Geofence boundaries are defined using latitude, longitude, and customizable radius parameters for accurate detection. Push notifications are generated instantly when the user enters the specified location zone. The application ensures secure local data handling and efficient database management. The user interface is designed to be simple, interactive, and easy to configure for all types of users. This solution enhances real-time task management by combining mobility, automation, and intelligent location tracking.

Keywords *Location-Based Reminder, Geo fencing, GPS, Android Application, Google Maps API, SQLite Database, Location-Aware System, Mobile Computing, Context-Aware Alerting, Android SDK.*

DESIGNED FOR DYNAMIC NETWORKS: ADAPTIVE BACKPRESSURE ROUTING

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Abstract. Backpressure routing is a gating, dynamic, and adaptive congestion-control mechanism efficiently using as much of the channel bandwidth to maximize throughput in communication networks. Instead of forwarding packets on predetermined paths or multiple paths with static metrics, backpressure routing makes its decision based upon the current differences in queue length between neighbouring nodes. By routing data along the paths to nodes with lower levels of congestion, without any global network knowledge, this is an effective traffic balancing algorithm that prevents bottlenecks as well. Coming from the theoretical Lyapunov optimization approach, it guarantees throughput optimality and queue stability as long as the traffic load is below network capacity. Despite potentially greater latency and memory overhead stemming from the maintenance of per-destination queues, the approach is practical with various improvements (e.g., delay-aware routing, aggregated queue and energy-aware adaptations). Backpressure routing, widely deployed in diverse wireless mobile and distributed network environments, is still a prime candidate as the foundation for resilient scalable and efficient data transmission in modern dynamic systems.

Keywords: *Adaptive Backpressure Routing, Dynamic Networks, Congestion Control, Lyapunov Optimization, Throughput Optimality.*

BEDZTM-PQC: POST-QUANTUM DECENTRALIZED ZERO-TRUST API GATEWAY

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Abstract: The increasing reliance on API-driven, cloud-native, and distributed systems has introduced significant security challenges that traditional perimeter-based models can no longer address. Zero Trust Architecture (ZTA) has emerged as an effective approach by enforcing continuous verification of identities, devices, and access requests. However, most existing zero-trust implementations rely on centralized control mechanisms and classical cryptographic algorithms, which are vulnerable to single points of failure and future quantum computing attacks. To address these limitations, this paper proposes **BEDZTM-PQC**, a **Block chain-Enabled Decentralized Zero-Trust Model with Post-Quantum Cryptography** for secure API gateway architectures. The proposed model integrates post-quantum cryptographic primitives to ensure long-term confidentiality and authentication, even in the presence of quantum adversaries. Blockchain technology is employed to decentralize trust management, securely store access policies, and maintain tamper-resistant audit logs, eliminating dependence on centralized authorities

Keyword: *Post-Quantum Cryptography (PQC), Zero-Trust Architecture (ZTA), Decentralized Security, API Gateway, Quantum-Resistant Algorithms, Distributed Ledger Technology (DLT), Identity and Access Management (IAM), Cloud Security.*

MACHINE LEARNING-DRIVEN DETECTION AND MITIGATION OF PRIVILEGE ESCALATION ATTACKS IN CLOUD ENVIRONMENTS

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Abstract—The rise of cloud computing and IoT devices has brought with it a lot of new cybersecurity problems. Because centralized cloud storage is such a concentrated target, it can be hard to build effective distributed security measures. The outside hackers should be avoided, but the threat of malicious insider is greater. These individuals are far more able to do harm than any outside attacker could because they already have legitimate access and permissions. In this paper we introduce a statistical Machine Learning based methodology to detect and classify insider threats via abnormal behaviours found in both horizontal and vertical privilege escalation. The system relies on ensemble learning, a technique that involves combining multiple models to boost the performance of the predictions made on data, to sidestep the issues associated with previous methods that have difficulty identifying attacks accurately. A set of 4 ensemble algorithms were compared, allowing a comparison of the results of Random Forest (RF), AdaBoost, XGBoost, and LightGBM, based on the specially designed dataset retrieved via the CERT insider threat records. The overall detection accuracy of Light GBM was the highest (97%), as shown by experimental results, followed by RF, XGBoost and AdaBoost (88.27, 88 and 86 each). In order to further improve classification accuracy, this study also uses the CatBoost algorithm as a sophisticated addition to these conventional ensemble approaches. These results confirm that a strong and dependable method for protecting cloud environments from internal privilege escalation is ensemble-based machine learning.

Keywords— *Cloud Computing, Privilege Escalation, Insider Threat Detection, Deep Learning Cybersecurity.*

A DATA-DRIVEN APPROACH FOR EARLY DIAGNOSIS OF AUTISM SPECTRUM DISORDER

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Abstract: Autism Spectrum Disorder (ASD) is a developmental disorder, which affects socialization, interaction and behavior. Early detection of ASD is critical in order to ensure the intervention is done early and long-term outcomes enhanced. Nevertheless, the traditional diagnostic processes tend to rely on the observation of experts and prolonged clinical examinations. This article portrays a machine learning system that detects ASD early on with the behavioral questionnaire information. ASD-Final dataset's which was obtained on Kaggle is used in the analysis of experiments. Numerous classification frameworks, such as LightGBM, XGBoost, and Logistic Regression, are created and tested. The measurements of the model performance are the accuracy, precision, recall, F1-score, confusions matrix-tab and ROC. The experiment results indicate that the ensemble-based gradient boosting models are better than the baseline approach. LightGBM is one of the bestranked models that has low misclassification and good classification accuracy. The results suggest that machine learning algorithms can help in the early diagnosis of ASD by using questionnaire-based data and allow the doctors to take the right decision.

***Keywords*—** *Autism Spectrum Disorder, Early Detection, Machine Learning, Behavioral Questionnaire, LightGBM*

MACHINE LEARNING-BASED CROP YIELD PREDICTION FOR PRECISION AGRICULTURE

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ABSTRACT Accurate crop yield prediction plays a vital role in agricultural planning, food security, and economic stability, particularly in regions highly dependent on farming. Traditional yield estimation techniques, which rely on expert judgment, often fail to capture the complex and nonlinear relationships among environmental, climatic, and agronomic factors. This study proposes a machine learning–based crop yield prediction system that leverages historical agricultural datasets, including weather parameters (rainfall, temperature, and humidity), soil characteristics (pH level and nutrient content), and crop-specific attributes. Multiple machine learning algorithms, namely Linear Regression, Random Forest, and Support Vector Machine, are implemented and evaluated to assess their predictive performance. Data pre-processing techniques such as normalization, handling missing values, and feature encoding are applied to enhance model accuracy. The models are trained and tested using standard performance metrics, including Mean Absolute Error (MAE), Mean Squared Error (MSE), and the coefficient of determination (R^2). Experimental results indicate that machine learning models outperform traditional statistical approaches in predicting crop yield, with ensemble-based methods such as Random Forest achieving the highest accuracy and robustness. The proposed system provides a reliable decision-support tool for farmers, policymakers, and agricultural organizations by enabling early yield estimation, efficient resource management, and improved crop planning. This research highlights the potential of machine learning techniques in promoting precision agriculture and sustainable food production.

Keywords: *Crop Yield Prediction, Machine Learning, Agriculture, Data Analytics, Precision Farming*

GEOSENSE: AI-POWERED SMART TOURISM COMPANION WITH IMAGE-BASED DESTINATION RECOGNITION AND INTEGRATED TRAVEL SERVICES

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ABSTRACT GeoSense utilizes the continuous learning capability of the CNN model to insure accuracy, real-time synchronization of both Traveler and Tour Guide using Firebase. GeoSense is also focused on maintaining the privacy of users' data, as well as optimizing the SmartStream Architecture to create a seamless, high-performance travel experience. GeoSense: AI-Powered Smart Tourism Companion is a cutting-edge mobile application aimed at revolutionizing the travel experience through the combination of intelligent image recognition and real-time services. Providing a complete solution for discovering destinations and managing bookings, this platform will address the gap between the traveler's curiosity and the availability of information. Travelers will not find personalized suggestions for lesser-known sites through traditional tourism apps because of exhausting manual searches. The purpose of this project is to develop an automated landmark identification system that will address the previous and current limitations of traditional tourism apps. Through a Convolutional Neural Network (CNN), the app will use the images uploaded by users to instantly determine location information and additional points of interest that are nearby. The GeoSense Initiative will develop an infrastructure for an integrated dual unit user experience that will improve access to travelrelated services between the user and guide. The Geosense implements this SmartStream Architecture uses Firebase as a robust backend to process all data and Flutter as a cross-platform frontend to provide an immersive experience for the users. Some of the key features of the proposed approach include providing secure authentication; automated image processing; and providing an integrated booking module. The results of the GeoSense Initiative suggest that GeoSense will provide an efficient, scalable, and interactive system to improve travel access. The establishment of a solid foundation for Smart Tourism and the ability for the modern traveler to make informed decisions will be facilitated through the utilization of accurate identification methods established by AI.

Keywords: *CNN, Smart Tourism, Travel Assistance, Image Recognition, Flutter, Mobile App.*

MYTH CODE: A SMART ASSISTIVE MORSE CODE COMMUNICATION FRAMEWORK FOR DIVYANGJAN USERS

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Abstract: Morse code is adopted as a communication medium due to its standardized, signal based structure that enables message transmission through auditory tones, visual flashes, or symbolic text without dependence on spoken language or continuous visual interfaces. Its operational reliability and minimal resource requirements make it applicable in assistive communication systems, emergency response scenarios, defines and maritime operations, aviation signalling, and accessible digital environments where robust and multisensory information exchange is critical. Morse code uses simple dot-dash patterns that can be transmitted through sound, light, or text, making it adaptable for multiple disabilities. Its low bandwidth, non-verbal structure enables communication even in emergency and assistive scenarios. Morse code allows communication through simple patterns that can be delivered as sound, light and morse text, making it flexible for individuals with visual, hearing and speech impairments. It reduces dependence on a single sensory channel and provides an alternative, independent method of expressing messages in daily, educational, and emergency situations. The existing project is **Computer-Assisted Language Learning (CALL)** for Special Needs focuses on standard screen readers like NVDA and JAWS that often prioritize text-to-speech for visually impaired users. Existing systems lack a unified multisensory framework that simultaneously serves deaf, blind, and speech-impaired users, often neglecting light-based or gamified interaction for holistic accessibility. The proposed system follows a **Modular Mobile Architecture** consisting of a Learning Module, Live Translation Module, and Interactive Assessment Module, built with an accessible multisensory UI/UX design named **"Adaptive Sensory Interface (ASI)."** The application integrates synchronized audio tones, flashlight signaling, visual text output, chatbots interaction, file upload translation, and real-time voice-to-Morse conversion to ensure inclusive communication. The completion of development, the Basic Learning module, structured Lesson section, and Morse Chatbot with live text and voice-to-Morse conversion have been successfully implemented.

Keywords: *Morse code Translation, Multisensory Communication, Assistive Technology, Accessible User Interface (ASI) and Modular Mobile Application*

MICROORGANISM IMAGE RECONITION AND DISEASE PREDICTION USING DEEP LEARNING

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ABSTRACT Despite tremendous recent interest, the application of deep learning in microorganism image recognition and disease prediction has not still reached its full potential. Microorganisms are small living organisms which cannot seen by naked eye and are visible only under microscope. Microorganisms like virus, bacteria and fungi are seen everywhere- air, food and even in human body. Microorganism in human body can be both beneficial and harmful. Beneficial like boosting immunity, digestion, etc. And harmful microorganism can cause several infections like fever, cold, cough, diarrhoea and skin infections. Microorganisms are identified by collecting blood samples. The collected blood sample is smeared on a glass slide and kept under a microscope which is attached with a camera that captures the image. The captured images are collected and uploaded as dataset and the dataset is used to train the CNN model. It processes the image and analyses the features such as colour, shape and size of the microorganism. Based on the analysis, the system classifies the image as infected or uninfected.

Keywords: Microorganism, Deep Learning, Convolutional Neural Network, Image classification, Disease prediction.

AI BASED EARLY DETECTION OF PLANT DISEASE IN MACHINE LEARNING AND DEEP LEARNING.

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ABSTRACT Agriculture plays a vital role in global food production, but plant diseases significantly reduce crop yield and quality each year. Early and accurate detection of plant diseases is essential to prevent large-scale agricultural losses and ensure food security. Traditional disease identification methods rely on manual inspection by experts, which can be time-consuming, labour-intensive, and prone to human error. To address these challenges, this project focuses on the development of an AI-based early detection system for plant diseases using Machine Learning (ML) and Deep Learning (DL) techniques. The proposed system utilizes image processing and computer vision to analyse leaf images and identify disease symptoms at an early stage. Machine Learning algorithms such as Support Vector Machines (SVM) and Random Forest are used for feature-based classification, while deep learning models, particularly Convolutional Neural Networks (CNNs), automatically extract relevant features and provide higher accuracy in disease detection. By training the model on labelled datasets such as plant village, the system learns to recognize patterns associated with various plant diseases. This AI-driven approach enables rapid, accurate, and cost-effective disease diagnosis, which can be integrated into mobile applications or smart farming systems for real-time monitoring. The implementation of such technology promotes precision agriculture, reduces unnecessary pesticide usage, and supports sustainable farming practices. Overall, the project demonstrates how machine learning and Deep Learning can transform traditional agriculture into an intelligent and data-driven system.

Keywords: *Artificial Intelligence, Machine Learning, Deep Learning, Plant disease detection, Precision Agriculture, Computer Vision*

FREQUENT CROP GROWTH MONITORING SYSTEM USING DEEP LEARNING -NEURAL NETWORK.

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Abstract: Agriculture faces challenges in monitoring crop health efficiently. This project introduces a frequent crop growth monitoring system utilizing deep learning neural networks. By processing images captured via drones or satellites, the system assesses plant health, growth stages, and potential diseases. Real-time data analysis allows farmers to make informed decisions regarding irrigation and fertilization. The model identifies anomalies indicating pest infestations or nutrient deficiencies early. This proactive approach optimizes yield and reduces resource wastage. The system aims to modernize farming practices through precision agriculture. Implementation ensures scalability for large fields. Ultimately, this technology supports food security by maximizing productivity while minimizing environmental impact through targeted interventions based on accurate, continuous crop monitoring data.

Keyword : Deep Learning–Based Crop Health Monitoring, Drone and Satellite Image Analysis. Real-Time Anomaly Detection in Agriculture, Precision Agriculture for Yield Optimization

HELLO HOPE APP: AN INTERACTIVE AI-BASED EMOTIONAL SUPPORT SYSTEM 1C.

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ABSTRACT: Mental health concerns such as stress, anxiety, and depression are increasingly affecting college students due to academic pressure, career uncertainty, and social challenges. These concerns highlight the importance of creating accessible and continuous digital support systems that can assist students in managing their emotional well-being in a safe and supportive manner. Existing research on mobile mental health interventions demonstrates that digital platforms can enhance emotional self-awareness, support early identification of psychological distress, and improve user engagement through interactive and AI-enabled features. Conversational systems, in particular, encourage open emotional expression and sustained interaction compared to traditional static assessment tools. In earlier research, the "Feel Better App for School Children" utilized the Anxiety, Depression, and Stress Scale (ADSS) as a one-time assessment to evaluate emotional levels and recommend relaxation techniques. Although effective for initial screening, the application lacked reassessment capability, continuous engagement, and personalized emotional tracking. To address these limitations, the proposed Hello Hope App is designed using a Modular Layered Architecture Model that integrates secure user authentication, a one-time ADSS onboarding assessment, AI-based conversational support (text and voice), mood tracking, and relaxation assistance within a unified system. The UI/UX follows a Human-centred Design approach, offering simple navigation, chatbot-centred interaction, visual mood tracking, and personalized engagement to create a comfortable and emotionally supportive digital environment. The Completed stage of the AI chatbot, mood tracking feature, basic relaxation module, and secure login system are implemented.

Keywords: Mental Health Application, AI Chatbot, ADSS Scale, Mood Tracking, Emotional Support, Modular Architecture.

AN INTERPRETABLE HYBRID MACHINE LEARNING FRAMEWORK FOR EARLY PREDICTION OF POLYCYSTIC OVARY SYNDROME (PCOS)

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ABSTRACT: Polycystic Ovary Syndrome (PCOS) is one of the most common endocrine disorders affecting women of reproductive age, often leading to complications such as infertility, metabolic syndrome, and cardiovascular diseases if not diagnosed early. Traditional diagnostic approaches rely on clinical examinations, hormonal assays, and ultrasound imaging, which may delay timely detection. To address this challenge, this study proposes an interpretable hybrid machine learning framework for the early prediction of PCOS using clinical, biochemical, and lifestyle-related parameters.
The proposed framework integrates multiple machine learning algorithms, including ensemble and boosting techniques, to enhance predictive performance while maintaining model transparency. Feature selection methods are applied to identify the most significant risk factors contributing to PCOS, and model interpretability is achieved using explainable AI techniques such as SHAP (Shapley Additive Explanations) and feature importance analysis.
The results highlight the potential of combining predictive accuracy with interpretability to support clinicians in early diagnosis and decision-making. The proposed framework not only improves early detection rates but also provides meaningful insights into the contributing factors of PCOS, thereby promoting personalized treatment strategies and better healthcare outcomes.

Keywords: PCOS, Machine Learning, Ensemble Learning, Random Forest, XGBoost, Explainable AI, Early Diagnosis, Predictive Analytics

AI-BASED SMART STUDENT ERP SYSTEM WITH ACADEMIC RISK PREDICTION AND AUTOMATED PARENT NOTIFICATION

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ABSTRACT: In modern educational institutions, managing student attendance and academic performance manually is time-consuming, inefficient, and prone to human error. Traditional systems often lack real-time communication with parents and do not provide predictive insights into student outcomes. To address these limitations, this project proposes an AI-Based Smart Student ERP System that automates attendance tracking, performance monitoring, and parent notifications while integrating predictive analytics for early academic risk detection. The system is developed using Python and the Django framework, with a structured database to store student information, attendance records, examination marks, and assignment scores. Teachers can record attendance digitally, reducing paperwork and administrative workload. When a student is marked absent, the system automatically sends an SMS or WhatsApp notification to the parent, ensuring immediate communication and improved accountability. In addition to automation, the system incorporates Machine Learning techniques to analyze attendance percentages and academic performance data. A Logistic Regression model is used to predict whether a student is at academic risk. If the model identifies a high probability of poor performance or potential failure, an automated alert is sent to parents to enable timely intervention. The system also includes a basic AI chatbot module that allows parents to access attendance and academic details through automated responses. By combining automation, predictive analytics, and intelligent communication features, the proposed system enhances efficiency, strengthens parent-school collaboration, and supports proactive academic management.

Keywords: Artificial Intelligence (AI), Student ERP System, Attendance Management, Academic Performance Monitoring, Logistic Regression

BLOCKCHAIN-BASED CERTIFICATE VERIFICATION: A SYSTEM TO SECURE AND VERIFY DIGITAL DOCUMENTS.

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Abstract: Document fraud is a significant concern in education and employment sectors. This project proposes a block chain-based certificate verification system to secure digital academic and professional documents. The system stores certificate hashes on a decentralized block chain ledger to ensure immutability, transparency, and security. Employers and institutions can instantly verify the authenticity of certificates without relying on intermediaries. Smart contracts are implemented to manage certificate issuance and verification processes efficiently. This approach eliminates forgery risks associated with traditional paper-based certificates and enhances trust in digital credentials. The system also allows users to maintain control over their data while granting access when required. Overall, this solution streamlines verification workflows, reduces administrative costs, and protects institutional reputation through a secure and tamper-proof infrastructure.

Keywords : Block chain, Distributed Ledger Technology (DLT), Decentralized Verification, Digital Certificate Authentication, Immutable Ledger

DEEP LEARNING TO DETECT MELANOMA IN DARK SKIN FAIRLY: AN EXPERIMENTAL STUDY

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Abstract— Melanoma is a severe type of skin cancer, which has its origin in melanocytes which produce melanin. Despite the great progress of deep learning in skin cancer detection with automated systems, the majority of current models are trained with large datasets of lighter skin, reducing their diagnostic accuracy of darker skin. The given research aims at enhancing melanoma detection in the dark skin imaging with sophisticated deep learning algorithms. The framework suggested is an optimized image processing used to give the low-visibility dermoscopic images better contrast and texture and then a convolutional neural network (CNN) is used to extract and classify the features automatically. The model is tested on well balanced datasets of various skin tones in order to reduce the level of algorithm bias. The accuracy, precision, recall (sensitivity), and F1-score are used as a measure of performance. Findings reveal better dark skin image detection than the traditional methods. The article fosters equitable development of AI and leads to more dependable and accurate skin cancer diagnostic systems.

Keywords: Melanoma detection, deep learning, CNN, AI fairness, sensitivity, F1-score.

EARLY DETECTION OF MESOTHELIOMA USING MACHINE LEARNING TECHNIQUES

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Abstract: Mesothelioma is a rare but aggressive form of cancer that primarily affects the lining of the lungs (pleura) and is strongly linked to prolonged exposure to asbestos. Early and accurate diagnosis is crucial, as delayed detection often leads to limited treatment options and lower survival rates. However, traditional diagnostic methods such as imaging, biopsies, and manual analysis are time consuming, invasive, and may not always provide early-stage detection. In this project, we explore the application of various machine learning algorithms— including Logistic Regression, Support Vector Machines (SVM), Decision Trees, and Random Forest—to detect mesothelioma based on clinical and biochemical data. The project also incorporates advanced techniques like feature importance analysis using SHAP (SHapley Additive exPlanations), dimensionality reduction using PCA and t-SNE, and rigorous evaluation using metrics like accuracy, precision, recall, F1- score, and ROC- AUC. The Machine learning algorithm delivering equal sensitivity and specificity, supported by ROC-AUC curves, confusion matrices, and exportable reports. The system demonstrates potential as an explainable AI-powered clinical decision support tool for fast, accurate mesothelioma detection.

Keywords: Explainable AI (XAI), SHAP Analysis, Random Forest, Support Vector Machine, Healthcare Data Analytics.

PROVENANCE OVER PRODUCT: USING TYPING PATTERNS AND CONCEPT EVOLUTION TO RESTORE ACADEMIC TRUST

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Abstract: The rise of Large Language Models (LLMs) has left many educators feeling like "digital police," trapped in a high-stakes technological arms race that traditional plagiarism tools simply cannot win. This culture of surveillance doesn't just fail to catch AI; it actively harms our students, particularly non-native speakers who are often unfairly flagged by biased detection software. This paper argues that the solution to this integrity crisis lies not in more policing, but in a return to "Forensic Pedagogy"—a framework that shifts our focus from the final "product" to the beauty of the human process. We propose moving beyond suspicion toward "Provenance-Validation," where we verify the unique journey of a student's thought. To make this practical and fair, we introduce a dual-layered approach using transparent evaluation models. First, we use Author Identification Modeling to honor a student's unique linguistic "fingerprint." By integrating Fairness-Aware Learning, we ensure that their authentic voice is protected rather than penalized for its simplicity or structure. Second, we introduce process-oriented auditing through Typing Pattern Recognition to create a transparent record of human effort. When paired with Concept Evolution Mapping, these tools allow us to visually verify the iterative growth of a student's ideas—from the first messy draft to the final reflection. This "proof-of-thought" audit trail ensures that while AI might assist, the human remains the high-level guardian of the logic. Ultimately, Forensic Pedagogy offers a roadmap for a future of "Declared Collaboration." By embracing these methods, institutions can move past the limitations of binary detectors and redefine academic integrity as a transparent, honest partnership between human curiosity and machine assistance. This approach ensures that education remains a deeply human experience where machine speed never outruns human purpose.

Keywords: Forensic Pedagogy, Provenance-Validation, Author Identification Modeling, Typing Pattern Recognition, Fairness-Aware Learning, Concept Evolution Mapping, Academic Integrity. Human-Centric AI

COMPARATIVE STABILITY ANALYSIS OF HIGH-ORDER AMPLITUDE-DISCRETIZED SIGNALING UNDER AWGN

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Comparative Stability Analysis of High-Order Amplitude-Discretized Signalling Under AWGNHigh-order amplitude-discretized signalling provides a framework for mapping unique amplitude levels directly to symbolic information. This study investigates the stability of such amplitude-based symbol representations under additive white Gaussian noise (AWGN), focusing on the tradeoff between symbol density and noise resilience. By considering schemes with varying numbers of amplitude levels, we analyze the conditions under which reliable symbol discrimination is maintained. Simulation-based observations identify amplitude ranges and operating conditions where high-density signalling remains robust against noise-induced errors. The findings offer practical insights for designing reliable amplitude-discretized signalling systems, highlighting considerations for information density, stability, and potential applications in computational intelligence and adaptive signal processing. This work emphasizes the feasibility of human-readable symbolic communication using amplitude discretization, providing a foundation for further exploration of high-order signalling paradigms.

Keywords: Amplitude discretization, AWGN, high-order signalling

DUAL-HAND GESTURE CONTROLLED VIRTUAL MOUSE

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Abstract: This paper proposes a dual-hand gesture-driven virtual mouse framework that redefines touchless human-computer interaction using real-time vision-based processing. Unlike conventional gesture systems limited to basic cursor control, the proposed approach introduces a structured dual-hand coordination model that separates navigation and system level interaction. MediaPipe-based hand tracking is employed to extract twenty-one spatial landmarks per hand, and a deterministic finger-state evaluation mechanism is designed for accurate gesture classification. The left hand enables window management, gaming commands, multimedia control, and system shortcuts. To address instability commonly observed in vision-based interaction, the framework integrates movement gating logic, adaptive smoothing, tremor suppression, and temporal cool down regulation to minimize unintended command execution. The system operates exclusively y using a standard webcam without specialized sensors, ensuring low deployment cost. Experimental validation demonstrates reliable gesture discrimination, responsive command execution, and consistent performance under diverse illumination conditions, highlighting the practically and scalability of the proposed interaction paradigm.

Keywords: Gesture Recognition, Touchless Interface, Vision-based Interaction, Media Pipe-Based Hand Tracking, and Adaptive Smoothing.

A REVIEW ON ARTIFICIAL INTELLIGENCE LEARNING ASSISTANT FOR SLOW LEARNERS THROUGH ACTIVE COOPERATIVE LEARNING

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Abstract: Artificial Intelligence has emerged as a powerful tool for enhancing personalized learning and improving accessibility in education. In particular, slow learners require adaptive instructional strategies that simplify academic content and support gradual concept acquisition. This review presents a comprehensive review of research related to AI-based learning systems, cooperative learning methodologies, and content simplification techniques for slow learners. Studies ranging from social learning theory and intelligent tutoring systems to modern Natural Language Processing-based educational tools are examined and categorized. The review analyzes key dimensions including personalization mechanisms, cooperative learning integration, text simplification methods, and learner engagement strategies. It identifies major challenges such as limited scalability, lack of real-time adaptability, and insufficient integration of cooperative learning principles within AI-driven systems. Based on the comparative analysis of existing approaches, this paper highlights the need for an intelligent learning assistant that combines AI-based content simplification with active cooperative learning frameworks. The review aims to provide a structured reference for future research toward developing inclusive, adaptive, and learner-centered educational technologies for slow learners.

Keywords: AI Learning Assistant, Slow Learners, Active Cooperative Learning, Natural Language Processing , Adaptive Learning Systems

INTERVIEW SIMULATOR WEB APPLICATION

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Abstract: In today's competitive employment landscape, interview performance plays a decisive role in candidate selection, yet many students and job seekers remain inadequately prepared due to limited access to realistic practice environments and structured, objective feedback. Conventional preparation methods—such as memorizing common questions or participating in informal mock interviews—often fail to simulate authentic interview pressure or provide measurable insights into communication effectiveness, technical depth, and problem-solving ability. These gaps underscore the need for an intelligent, data-driven solution to interview preparation. This project presents the design and development of an AI-powered Interview Simulator that delivers a realistic, interactive, and structured mock interview experience. The system dynamically generates role specific interview questions, evaluates user responses in real time, and provides actionable feedback through an intuitive analytics dashboard. Key features include customizable interview simulations based on job role and difficulty, performance tracking across multiple sessions, and detailed visualizations highlighting strengths, weaknesses, skill distribution, and progress trends. By integrating realism with analytical depth, the platform aims to improve both user confidence and interview competency. The system leverages structured question datasets categorized by role, domain, and complexity, alongside AI models that generate adaptive follow-up questions based on user responses. User interaction data—including response content, timing, session duration, and AI-generated scores—is continuously analyzed to deliver personalized feedback focused on clarity, structure, and technical accuracy. Built on a modular architecture using React, Django, PostgreSQL, and MongoDB, the platform demonstrates scalability and maintainability. Experimental results confirm the system's effectiveness in enhancing interview realism and enabling measurable performance improvement over time, offering a robust, data-driven alternative to traditional interview preparation methods.

Keywords: AI Interview Simulator, Interview Preparation, Artificial Intelligence, Performance Analytics, Adaptive Question Generation

EXPLAINABLE GRADIENT BOOSTING FRAMEWORK FOR EARLY IDENTIFICATION OF AT-RISK STUDENTS AND TARGETED ACADEMIC INTERVENTION

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Abstract: Early identification of students at academic risk is essential for improving educational outcomes and reducing underperformance. This study presents an interpretable and high-performance machine learning framework for detecting at-risk students using measurable academic and behavioural indicators. Moving beyond purely accuracy driven models, the proposed approach integrates predictive strength with explain ability to support timely and actionable academic interventions. The problem is formulated as a binary classification task to distinguish students at academic risk from those performing satisfactorily. An Extreme Gradient Boosting (XGBoost) model is employed due to its effectiveness on structured educational datasets and its ability to model complex non-linear feature interactions. Key predictors include prior academic performance, attendance records, study duration, and sociodemographic attributes. Model evaluation emphasizes recall and F1-score to ensure reliable identification of vulnerable students while maintaining balanced classification performance. To enhance transparency, SHAP (Shapley Additive explanations) analysis is incorporated to interpret both global feature importance and individual student-level predictions. This enables educators to understand the underlying drivers of academic risk and design personalized intervention strategies. Based on analytical findings, an intervention-oriented framework is proposed to facilitate early counseling, targeted mentoring, and continuous performance monitoring. The results demonstrate that explainable ensemble learning models can function as robust early warning systems while maintaining trust and interpretability in institutional decision-making processes.

Keywords: Early Warning Systems, Student Performance Prediction, At-Risk Student Identification, XGBoost, Explainable AI (XAI), SHAP.

AI-DRIVEN PERSONALIZED RECOMMENDATION ENGINE FOR E-COMMERCE PLATFORMS

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Abstract: The exponential growth of e-commerce platforms has intensified the need for intelligent systems capable of delivering personalized user experiences. This research paper presents a comprehensive analytical study of AI-driven personalized recommendation systems within digital commerce environments. It examines the theoretical foundations and algorithmic frameworks underlying recommendation methodologies, including collaborative filtering, content-based filtering, hybrid models, and deep learning-based approaches. The study explores how artificial intelligence techniques enable user preference modeling, behavioral pattern analysis, and predictive decision-making through structured data interpretation. Rather than emphasizing practical implementation, this research focuses on conceptual architectures, data modeling strategies, and algorithmic optimization principles that support scalable and adaptive recommendation systems. Key challenges such as cold-start issues, data sparsity, diversity–accuracy trade-offs, and system scalability are critically analyzed from a research perspective. The paper also reviews emerging trends in AI personalization, highlighting the integration of advanced machine learning models to enhance recommendation accuracy and contextual relevance. By synthesizing contemporary research developments and theoretical insights, this study underscores the strategic significance of AI-powered recommendation frameworks in shaping intelligent, customer-centric e-commerce ecosystems and fostering sustainable digital business growth and innovation.

Key Words: Artificial Intelligence, Personalized Recommendations, E-Commerce Platforms, Machine Learning, Predictive Analytics, Customer Behavior Analysis.

ATTENTION-ENHANCED BIDIRECTIONAL LSTM FRAMEWORK FOR MULTI-CLASS ANXIETY AND DEPRESSION RISK PREDICTION AMONG INDIAN SECONDARY SCHOOL STUDENTS

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Abstract: Adolescent mental health issues, especially anxiety and depression, are becoming increasingly common in Indian secondary schools due to academic competition, exam-related stress, and socio-economic challenges. Early detection is difficult because of limited access to counselors and the lack of scalable screening methods. This study introduces an Attention-Enhanced Bidirectional Long Short-Term Memory (BiLSTM-Attention) model to classify student mental health risk levels based on textual responses from academic settings. The model categorizes inputs into Normal, Anxiety Risk, and Depression Risk. Using a dataset of 8,200 anonymized texts collected from CBSE-affiliated schools in Tamil Nadu and annotated by trained psychology graduates, the model achieved 92.1% accuracy and showed notable improvement in recall for the Depression category compared to baseline models. Designed as a preventive screening tool, the framework aligns with the National Education Policy 2020 and promotes ethical AI use in schools. The findings demonstrate the potential of attention-based contextual modeling for responsible AI-supported mental health monitoring in educational environments.

Keywords: Mental Health Monitoring, Bidirectional LSTM, Educational Artificial Intelligence, Anxiety Detection, Depression Classification.

LEUKEMIA DETECTION TO COMPUTER VISION

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Abstract: Leukemia is a type of blood cancer that affects white blood cells and disrupts the body's immune system. Early and accurate detection is critical for improving patient survival rates. Traditional leukemia diagnosis relies heavily on manual microscopic examination of blood smear images by trained haematologists. This process is time-consuming, subjective, and dependent on expert availability. Recent advancements in deep learning have enabled automated analysis of medical images, including blood smear images. However, most existing systems use blackbox classifiers that provide predictions without explaining similarity or uncertainty, which limits trust and real-world adoption. This project proposes a prototype-based deep learning approach that detects leukemia by comparing new samples with learned representative prototypes, enabling more interpretable and reliable predictions.
Keywords: Leukemia Detection, Deep Learning, Prototype-Based Learning, Blood Smear Images, Medical Image Classification, Explainable AI.

AUTOMATED SCAM MESSAGE DETECTION USING TEXT ANALYSIS AND MACHINE LEARNING

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Abstract: The rapid increase of scam messages through SMS and online platforms poses a significant threat to digital communication, causing financial loss and compromising personal data. Many users are unable to reliably distinguish fraudulent messages from genuine ones, which increases their vulnerability to cybercrime. To address this challenge, this project proposes an automated system for detecting scam messages using text analysis techniques and machine learning algorithms. The system processes the textual content of messages, extracting features such as keyword patterns, message structure, and contextual cues indicative of fraudulent intent. Using Python, machine learning models are trained on labelled datasets containing both scam and genuine messages to accurately classify incoming messages. When a new message is received, the system analyzes it in real time and provides an alert if it is identified as potentially fraudulent. This automation reduces the reliance on manual inspection, mitigates financial risk, and enhances user confidence in digital communication. By integrating text mining and predictive modelling, the proposed system provides a scalable and efficient solution for scam message detection. It enables users to quickly identify fraudulent messages, safeguards sensitive information, and contributes to safer online and mobile communication environments. This project demonstrates how AI-driven text analysis can enhance cybersecurity and protect users from evolving digital threats.

Keywords :Scam Message Detection, Fraudulent Message Classification, Text Analysis, Machine Learning, Natural Language Processing (NLP), SMS Security.

SMART HEALTH RISK DETECTION WITH GENERATIVE AI SYSTEM

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Abstract : The increasing availability of digital healthcare data and advancements in artificial intelligence have created new opportunities for improving early health monitoring and preventive care. Traditional healthcare systems mainly focus on diagnosing diseases after symptoms appear, which can lead to delayed treatment and higher medical risks. Early identification of potential health risks plays a crucial role in improving patient outcomes and reducing healthcare burdens. This project proposes a Smart Health Risk Detection System powered by Generative Artificial Intelligence (GenAI) to enable proactive and intelligent health risk assessment. The proposed system utilizes generative AI techniques to analyze various health-related inputs, including medical history, lifestyle patterns, behavioural data, and physiological indicators. By processing both structured and unstructured data, the system can identify hidden patterns and detect deviations that may indicate potential health concerns. Unlike conventional AI models that focus only on prediction, generative AI enhances the system by providing contextual insights and meaningful explanations, making the outputs more understandable and user-friendly. A key objective of the system is to support early detection through continuous evaluation of health data. By combining historical records with real-time monitoring, the framework improves prediction accuracy and enables timely alerts. The system also emphasizes personalization, allowing health risk assessments to be tailored to individual profiles rather than relying on generalized models. This personalized approach helps in generating relevant preventive suggestions and promoting healthier lifestyle decisions. The framework is designed to be scalable and adaptable, allowing integration with wearable devices, mobile health applications, and digital health platforms. Such flexibility enables continuous monitoring and supports modern smart healthcare environments. By encouraging early awareness and preventive action, the system has the potential to reduce medical complications, optimize healthcare resources, and improve overall quality of life. In conclusion, the Smart Health Risk Detection System demonstrates how generative AI can transform traditional healthcare into a more predictive and patient-centred model. By combining intelligent data analysis with human-like generative insights, the system promotes early health awareness, personalized care, and proactive decision-making. This project highlights the growing role of generative AI in shaping the future of smart and preventive healthcare solutions.

Keywords: ***Generative Artificial Intelligence (GenAI), Smart Health Risk Detection, Predictive Healthcare, Early Disease Detection***

SMART CLIMATE CONTROL CITIES USING INTERNET OF THINGS

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Abstract: Modern cities experience environmental degradation because rapid urbanization and climate change create rising temperatures and increased air pollution and excessive energy consumption. The combination of these challenges creates threats to public health and environmental sustainability and the overall quality of life in cities. The Internet of Things (IoT) provides an effective technological solution which enables real-time environmental parameter monitoring and analysis and control through the creation of smart climate control cities. The paper presents an IoT-based framework which enables urban environments to achieve smart climate control. The system uses distributed environmental sensors which include temperature and humidity and air quality and carbon dioxide sensors to gather real-time environmental data from multiple city locations. The system sends collected data through Wi-Fi and 5G and LoRaWAN communication networks to cloud platforms which handle storage and processing and analysis. The intelligent control systems use analyzed data to automatically control urban systems which include smart buildings and traffic systems and street lighting and green space irrigation in order to achieve environmental sustainability and energy conservation. The proposed approach enhances urban sustainability by reducing greenhouse gas emissions, improving air quality, and increasing energy efficiency. The combination of Artificial Intelligence (AI) and data analytics with IoT systems will enable organizations to forecast climate impacts and make informed decisions. The potential of IoT-based smart climate control systems to create sustainable and resilient and eco-friendly smart cities faces three main obstacles which include high deployment costs and data security issues and infrastructure maintenance needs.
Keywords: IoT, Smart City, Climate Control

SECURE DATA SHARING IN CLOUD COMPUTING USING PROXY RE-ENCRYPTION

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Abstract: Cloud computing offers scalable storage solutions and facilitates easy data accessibility. However, secure data sharing in untrusted cloud environments is still a major challenge. Although conventional encryption methods ensure data confidentiality, they are not very efficient for dynamic and flexible data sharing among multiple users. To overcome this problem, this paper presents a secure data sharing method based on Proxy Re-Encryption (PRE).In the proposed system, data owners encrypt their data before uploading it to the cloud. For data sharing, the cloud server works as a proxy that changes the Ciphertext from the data owner's key to the recipient's key without decrypting the plaintext. This method ensures that the cloud service provider does not access confidential data while also being very efficient for controlled data sharing.The proposed model improves data confidentiality, simplifies key management, and offers fine-grained access control. The proposed model is very appropriate for secure data sharing in healthcare, finance, enterprise, and government environments.

Keywords: Cloud Computing ,Data Security, Proxy Re-Encryption (PRE),Public Key Cryptography, Secure Data Sharing, Access Control, Cloud Storage Security, Cryptographic Techniques.

ANALYSIS OF GEOLOCATION DATA FOR ACCOMMODATION USING K-MEANS CLUSTERING ALGORITHM

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Abstract In today's rapidly evolving and highly mobile global environment, individuals frequently migrate between cities for education, work, or leisure. One of the most significant hurdles they face is identifying suitable accommodation that aligns with their specific personal preferences, budget constraints, and proximity to essential amenities. While geolocational data is abundant, its sheer volume and complexity make it difficult for average users to extract actionable insights. This project addresses this challenge by developing a data-driven recommendation system that leverages machine learning to analyze and categorize potential living spaces based on their surrounding infrastructure. The core objective of this research is to utilize the K-Means Clustering algorithm to group geolocation data into distinct categories, such as "rich," "average," and "low" amenity zones. By doing so, the system can provide intelligent suggestions that help users find locations similar to their previous livelihood or tailored to their current needs. The methodology begins with comprehensive data collection, where information regarding accommodation types, prices, ratings, and coordinates is gathered into a structured format. This data undergoes rigorous pre-processing, including cleaning, handling missing values, and standardizing features to ensure the accuracy of the clustering process. To obtain precise geographical information, the project integrates the Here Geocoding and Search API v7 and utilizes th e Foursquare API for exploratory data analysis. Technical implementation is carried out using Python within the Google Colab environment, employing powerful libraries such as Pandas and NumPy for data manipulation, and Scikit-learn for the K-Means algorithm. The project places a strong emphasis on visualization, using the Elbow Curve method to determine the optimal number of clusters and tools like Folium, Matplotlib, and Seaborn to project these clusters onto interactive maps. Ultimately, this project demonstrates the transformative potential of geolocation analysis in the accommodation sector. By automating the identification of spatial patterns and market segments, the system offers a hassle-free and time-saving solution for travellers and migrants. The findings not only enhance the accuracy of accommodation recommendations but also provide a scalable framework that can be adapted to various urban environments and evolving consumer behaviours.

Keywords Machine Learning, K-Means Clustering, Geolocation Data, Data Visualization, Here Geocoding API, Exploratory Data Analysis.

AN LLM DRIVEN SYSTEM FOR AUTOMATIC ESSAY ASSESSMENT AND FEEDBACK GENERATION

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Abstract: The automated evaluation of descriptive answers remains a complex problem due to subjectivity, scalability constraints, and limited interpretability in traditional grading systems. This work proposes an explainable LLM-driven framework for automated essay assessment that integrates transformer-based semantic representation with mathematically grounded regression modeling. MiniLM is employed to generate contextual embeddings that encode semantic structure within essays, which are subsequently mapped to human-aligned scores using a regularized Ridge regression model to ensure stability in high-dimensional space. To enhance transparency, a transformer-based generative model (Phi-2) produces rubric-aligned, structured feedback for each evaluation criterion. The proposed system combines computational intelligence and applied mathematical modeling to deliver scalable, consistent, and interpretable essay evaluation suitable for large-scale educational environments.

Keywords: Automated Essay Scoring, Large Language Models, Transformer Embeddings, Ridge Regression, Explainable AI, Computational Intelligence.

AI-BASED PREDICTIVE ROAD SAFETY INTELLIGENCE AND POTHOLE MONITORING OPTIMIZATION SYSTEM

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Abstract : Road surface defects such as potholes significantly impact public safety, vehicle maintenance costs, and traffic efficiency. The traditional complaint-based reporting and road inspection systems are frequently sluggish, unreliable and also rely on manual verification. The predictive road safety intelligence and pothole monitoring optimization system proposed in this research paper uses artificial intelligence to automatically detect potholes, estimate their sensitivity, and facilitates structured reporting through a web-based platform. The proposed system recognizes potholes from user uploaded recorded videos and road photo using a YOLOv9 deep learning object detection model that was trained on annotated pothole datasets. The system also offers a CCTV-based road monitoring feature in addition to upload-based detection, allowing for surveillance camera feeds. To help prioritize maintenance, the system creates a road quality score, a pothole count, and a severity classification (Low, Medium, High) based on bounding box area. For the documentation and authority use, an automated PDF report with detection summaries and severity distribution is also produced. To improve openness and user involvement, there is also a complaint registration module with complaint ID creation and status monitoring. Both citizen-based and CCTV-based road monitoring with intelligent decision support are made possible with the help of this system which offers a scalable, affordable, and useful solution for smart city road maintenance.

Keywords- Automated reporting, CCTV monitoring, Complaint status tracking, Flask web application, Pothole Detection, Road quality score, Severity analysis, YOLOv9

EFFECTIVE COGNITIVE ASSESSMENT USING MACHINE LEARNING ALGORITHMS TO IDENTIFY INTELLECTUAL DISABILITIES.

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Abstract
Learning and intellectual disabilities significantly affect cognitive development, academic performance, and social functioning. Conventional diagnostic methods primarily rely on manual psychological assessments and expert interpretation, which are time-consuming, costly, subjective, and difficult to scale for early identification. Early screening is essential for timely intervention and effective inclusive education planning. Recent advancements in machine learning (ML) have demonstrated potential in improving the objectivity, scalability, and efficiency of cognitive assessment systems. However, existing ML-based approaches often face challenges such as limited generalizability, lack of interpretability, and a fragmented focus on isolated cognitive attributes. There remains a need for a scalable and interpretable ML-based framework that integrates multidimensional cognitive features for early-stage identification of intellectual disabilities. This paper proposes a web-based machine learning framework for effective cognitive assessment and early screening of intellectual disabilities. The system collects cognitive parameters including memory, attention, reasoning ability, and reaction time, and processes them using trained ML models to classify Intelligence Quotient (IQ) categories. The methodology includes data collection, pre-processing, feature engineering, and model training using Support Vector Machine (SVM), Random Forest, and Artificial Neural Network (ANN) algorithms. Performance evaluation is conducted using standard classification metrics. The proposed framework contributes an interpretable ML-based cognitive assessment model, identifies key cognitive indicators associated with intellectual disabilities, and supports educators and clinicians in early screening. Ethical considerations such as data privacy, anonymization, bias mitigation, and responsible AI usage are incorporated, positioning the system as a decision-support tool rather than a replacement for clinical diagnosis.

Keywords: **Intelligence Quotient (IQ), Machine Learning, Cognitive Assessment, Intellectual Disabilities, Classification, Adaptive Behaviour, Psychological Testing, Artificial Neural Network (ANN).**

ADAPTIVE EDGE-CLOUD INTELLIGENCE: A RESILIENT FRAMEWORK FOR SUSTAINABLE NEXT-GENERATION COMPUTING

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Abstract: The rapid evolution of computing demands innovative frameworks capable of addressing the growing challenges of sustainability, performance, and resilience. The concept of Adaptive Edge-Cloud Intelligence, a next-generation framework that seamlessly integrates edge and cloud computing paradigms. By leveraging adaptive algorithms and intelligent resource management, this framework enhances computational efficiency while minimizing environmental impact. Key features include dynamic workload distribution, real-time data processing, and the incorporation of machine learning techniques, enabling systems to adapt to fluctuating demands and optimize resource utilization. The resilience of the proposed framework is underscored through its ability to maintain service continuity and integrity in the face of potential disruptions, such as fluctuating network conditions and hardware failures. By redefining the synergy between edge and cloud resources, this approach not only enhances operational capabilities but also fosters sustainable practices in computing. The implications of this research extend to various industries, paving the way for environmentally conscious advancements in technology. Ultimately, Adaptive Edge-Cloud Intelligence presents a forward-thinking solution to the challenges of next-generation computing, promoting a sustainable future while ensuring robust performance and reliability.

Keywords: ***adaptive edge-cloud intelligence, sustainability, performance, resource management, machine learning.***

ADAPTIVE INTELLIGENT COMPUTING FRAMEWORKS FOR SCALABLE, SECURE, AND RESILIENT NEXT-GENERATION DIGITAL ECOSYSTEMS

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Abstract : The accelerated advancement of digital technologies has significantly increased the complexity of modern computing environments, creating critical demands for scalability, security, and operational resilience. Conventional computing models often exhibit limitations in dynamically responding to fluctuating workloads, evolving cyber threats, and heterogeneous system infrastructures. Addressing these challenges requires intelligent, adaptive mechanisms capable of optimizing system Behavior in real time. This study presents an Adaptive Intelligent Computing Framework designed to enhance system performance, reliability, and security through the integration of intelligent decision-making techniques with scalable architectural principles. The proposed framework incorporates adaptive algorithms, machine learning methodologies, and context-aware resource management strategies to enable systems to autonomously adjust to varying operational conditions. By employing a modular and flexible architecture, the framework supports dynamic allocation of computational resources, resulting in improved efficiency, reduced latency, and enhanced fault tolerance. Furthermore, the framework embeds a multi-layered security model that utilizes anomaly detection, behavioural analysis, and proactive threat mitigation mechanisms to safeguard systems against emerging vulnerabilities and sophisticated cyberattacks. Experimental evaluation within simulated distributed computing environments demonstrates improvements in system responsiveness, resource utilization, and security robustness. The findings indicate that adaptive intelligent mechanisms contribute to enhanced system stability and optimized performance without imposing significant computational overhead. The framework offers a practical solution for building resilient next-generation digital ecosystems, with applications spanning cloud computing, IoT infrastructures, and data-intensive systems. This research contributes to intelligent computing by presenting a unified model balancing adaptability, scalability, and security — essential requirements for modern digital transformation initiatives.

Keywords: Adaptive, scalability, security, detection, competitive

RESOL GATE: AN AI-ASSISTED APPROVAL BASED KNOWLEDGE REPOSITORY FOR EDUCATION AND RURAL LEARNING

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Abstract: unlike traditional cloud storage platforms, educational institutions need strong file management systems with built-in content moderation. In this paper, we present ResolGate, a TypeScript web application that combines multi-stage approval workflows with AI-powered content safety analysis. The system uses React 18 for the frontend interface, Sup abase PostgreSQL for data management, and Google Gemini 2.5 Flash for automated content moderation. To ensure granular access control and remove credential vulnerabilities, ResolGate integrates password less guest authentication. With an average processing time of 2.3 seconds, the AI moderation engine achieves 91.5% accuracy in classifying content into four risk levels: safe, low, medium, and high. Performance evaluation shows a 98.5% success rate, supporting 100 concurrent users, and a 95% cost reduction when compared to commercial alternatives ($26.50/month versus $500–1500). Best for the organization where the admin manages all the approvals and rejections along with AI checks, the user can login from anywhere with any username to open the repo and view download and share the knowledge. It will help in controlled file sharing with an admin approval workflow. Users can upload data , which will be in pending state until approval. The platform detects harmful or misleading content with AI.

Keywords—Content Moderation, File Management, AI Safety, React, Supabase, Edge Functions, Guest Authentication

RESOL GATE: AN AI-ASSISTED APPROVAL BASED KNOWLEDGE REPOSITORY FOR EDUCATION AND RURAL LEARNING

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Abstract: unlike traditional cloud storage platforms, educational institutions need strong file management systems with built-in content moderation. In this paper, we present ResolGate, a Typescript web application that combines multi-stage approval workflows with AI-powered content safety analysis. The system uses React 18 for the frontend interface, Sup abase PostgreSQL for data management, and Google Gemini 2.5 Flash for automated content moderation. To ensure granular access control and remove credential vulnerabilities, ResolGate integrates password less guest authentication. With an average processing time of 2.3 seconds, the AI moderation engine achieves 91.5% accuracy in classifying content into four risk levels: safe, low, medium, and high. Performance evaluation shows a 98.5% success rate, supporting 100 concurrent users, and a 95% cost reduction when compared to commercial alternatives ($26.50/month versus $500–1500). Best for the organization where the admin manages all the approvals and rejections along with AI checks, the user can login from anywhere with any username to open the repo and view download and share the knowledge. It will help in controlled file sharing with an admin approval workflow. Users can upload data , which will be in pending state until approval. The platform detects harmful or misleading content with AI.

Keywords—Content Moderation, File Management, AI Safety, React, Supabase, Edge Functions, Guest Authentication

MULTIMODEL LEARNING FOR DISEASE PREDICTION USING MEDICAL IMAGE AND TEXT REPORTS

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Abstract: Multimodal learning for Disease Prediction using Image plus Text. This project proposes a multimodal learning framework for accurate disease prediction by integrating medical imaging and textual patient records. Traditional systems often rely on single data sources, limiting diagnostic precision. Our approach utilizes deep learning architectures to process X-rays or MRI scans alongside clinical notes simultaneously. By fusing visual and textual features, the model captures comprehensive health indicators, reducing false positives. The system aims to assist healthcare professionals in early detection of complex diseases. Experimental results demonstrate improved accuracy compared to unimodal models. This innovation enhances clinical decision-making, ensuring timely interventions and personalized treatment plans, ultimately contributing to better patient outcomes and reduced healthcare costs through efficient diagnostic support.

Keyword : Multimodal Learning, Disease Prediction, Medical Image and Text Fusion, Deep Learning in Healthcare

SOCIAL MEDIA TOXICITY COMMENT ANALYZER

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Abstract:
Social media platforms have become primary channels for communication, but they also enable the rapid spread of abusive and harmful language. This project proposes a Social Media Toxicity Comment Analyzer, an intelligent system designed to automatically detect and classify toxic comments in online discussions. The system uses Natural Language Processing (NLP) techniques combined with machine learning models to identify different forms of toxicity such as insults, threats, hate speech, and offensive expressions. The proposed framework collects comment data from public social platforms, performs pre-processing steps including tokenization, stop word removal, stemming, and vectorization, and then applies supervised learning algorithms for classification. Multiple models such as Logistic Regression, Naive Bayes, and Long Short-term Memory (LSTM) neural networks are evaluated to improve accuracy and reliability. The model is trained using labelled datasets containing toxic and nontoxic comments, enabling it to learn linguistic patterns and contextual cues associated with abusive Behavior. The analyzer provides real-time prediction and a toxicity score indicating severity level. A web based interface allows moderators or users to input text and instantly receive classification results. The system can assist administrators in moderating discussions, reducing cyberbullying, and promoting healthy online interactions. Experimental results demonstrate that the proposed approach achieves high accuracy in detecting toxic content and significantly reduces manual moderation effort. This project highlights the effectiveness of machine learning based moderation tools in improving digital communication safety and can be extended to multilingual platforms in the future.

Keywords: Social Media Toxicity Detection, Natural Language Processing (NLP), Machine Learning-Based Text Classification, LSTM Neural Networks

WEB-BASED BLOOD DONATION MANAGEMENT SYSTEM FOR EFFICIENT DONOR-RECIPIENT COORDINATION

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Abstract: Efficient blood donation management is crucial for timely healthcare support, especially during emergencies. Traditional methods of maintaining donor records manually are often prone to data duplication, delays, and retrieval difficulties, which can hinder critical medical response. To address these challenges, this project proposes a web-based Blood Donation System that provides a centralized, secure, and user-friendly platform connecting blood donors with patients in need. The system enables donors to register by providing personal information such as name, age, blood group, contact details, location, and donation history. Registered donors' information is securely stored in a structured database, ensuring accuracy, minimizing manual errors, and supporting transparent tracking of donation status. Users can monitor donor activity, including the number of donations made and the duration of active contribution, which encourages regular voluntary participation. Patients or their family members can search for donors based on blood group and availability. Once a suitable donor is identified, direct communication is facilitated through the provided contact details, significantly reducing response time in emergencies. The platform is developed using HTML, CSS, and JavaScript, ensuring a responsive and interactive interface that is accessible to users from diverse backgrounds. By automating donor management and streamlining communication between donors and recipients, the system enhances efficiency, reduces paperwork, and improves healthcare support. Overall, this digital solution promotes voluntary blood donation, strengthens coordination in critical situations, and contributes to saving lives by ensuring timely access to blood resources.

Keywords:
Blood Donation System, Donor Management, Web-Based Application, Emergency Blood Requests, Healthcare Support

AN ENSEMBLE FUSION-BASED MACHINE LEARNING FRAMEWORK FOR CROP YIELD PREDICTION

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Abstract: Agricultural productivity is highly dependent on multiple dynamic factors, such as climate variability, soil characteristics, water availability, and crop management practices. In recent years, unpredictable weather patterns and environmental changes have made traditional crop yield estimation methods less reliable and inefficient. Accurate crop yield prediction is essential for farmers, agricultural planners, and government agencies to make informed decisions related to crop selection, resource allocation, supply chain planning, and food security management. This project proposes an intelligent Crop Yield Prediction System that leverages artificial intelligence, satellite remote sensing data, and historical agricultural datasets to provide accurate and scalable yield forecasting. The proposed system integrates multi-source data including satellite imagery, weather parameters (temperature, rainfall, humidity), soil properties, and historical crop yield records through an automated data pipeline. Vegetation indices such as Normalized Difference Vegetation Index (NDVI) are extracted from satellite data to monitor crop health and growth stages. Machine learning models are trained using these datasets to capture complex nonlinear relationships between environmental conditions and crop productivity. The system applies data prepro cessing, feature engineering, and model optimization techniques to improve prediction accuracy and model generalization across different geographical regions. In addition to prediction, the system provides actionable insights through a user-friendly dashboard designed for farmers and policymakers. The platform includes yield forecasting visualization, crop health monitoring, and early warning alerts for potential crop failures caused by adverse weather conditions. The proposed solution enhances decision-making capabilities, reduces uncertainty in agricultural planning, and promotes efficient resource utilization. By combining artificial intelligence with geospatial and environmental data analytics, the system con tributes to sustainable agriculture development and strengthens food security management at regional and national levels. Furthermore, the system is designed to be scalable and adaptable for different crop types and geographical environments by incorporating continuous learning mechanisms and real-time data updates. Cloud-based storage and processing frameworks enable large-scale data handling and faster model retraining as new seasonal data becomes available. The proposed frame work not only improves forecasting accuracy but also supports precision agriculture practices by enabling timely interventions, optimized fertilizer usage, and efficient irrigation planning. This ultimately helps in reducing production costs, increasing farmer profitability, and supporting long-term agricultural sustainability.

Keywords: Index Terms—Crop Yield Prediction, Ensemble Fusion, Machine Learning, Precision Agriculture.

REAL-TIME SIGN LANGUAGE TRANSLATION SYSTEM USING DEEP LEARNING AND COMPUTER VISION

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Abstract: Sign language serves as a primary mode of communication for individuals with hearing and speech impairments; however, communication barriers persist when interacting with people unfamiliar with sign language. To address this challenge, this paper proposes a real-time sign language translation system that integrates computer vision and deep learning techniques to convert hand gestures into readable text and synthesized speech. The system captures live video using a standard webcam and employs the MediaPipe Hands framework to detect and extract 21 three-dimensional hand landmark points, which are structured into a spatial feature vector representing finger articulation and hand orientation. These features are processed using a neural network model implemented with TensorFlow and Keras for multi-class classification of static sign language alphabets, consisting of fully connected layers with ReLU activation and a Softmax output layer that generates probability distributions across 26 alphabet classes. The predicted gesture is displayed as text and converted into audible speech using a text-to-speech module, enabling seamless interaction between hearing-impaired users and non-sign language users. Experimental evaluation on a custom dataset of 7,800 labeled samples achieved an overall classification accuracy of 95.8%, demonstrating robustness under varying lighting and background conditions. The proposed system provides a cost-effective, hardware-independent assistive communication solution and establishes a scalable foundation for future development in continuous gesture recognition and multilingual translation.

KEYWORDS:

Index Terms— Sign Language Translation, Hand Gesture Recognition, Media Pipe, Hand Landmark Detection, Text-to-Speech, Assistive Technology.

AGENTIC ARTIFICIAL INTELLIGENCE IN HIGHER EDUCATION: TRANSFORMING ADMINISTRATIVE ECOSYSTEMS THROUGH AUTONOMOUS DECISION SYSTEMS

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Abstract: Modern higher education institutions face growing administrative complexity in scheduling, enrolment management, student services, and campus operations. Traditional manual systems often lack the speed and adaptability required to manage data-intensive processes efficiently. Agentic artificial intelligence (AI) offers a transformative solution by deploying autonomous software agents capable of planning and executing multi-step objectives with minimal human intervention. Unlike conventional automation, agentic AI systems interpret real-time data, make context-sensitive decisions, and act according to institutional policies. In college management, they function as continuous digital administrators, optimizing classroom scheduling, streamlining admissions screening, monitoring student performance to identify at-risk learners, automating attendance and security systems, and improving energy and resource efficiency. They also enhance administrative workflows such as billing, registration, and advising coordination. Early implementations demonstrate significant efficiency gains, enabling faster application processing and reducing staff workload. However, responsible deployment requires strong governance frameworks to ensure transparency, fairness, and accountability. Overall, agentic AI represents an emerging infrastructural shift toward adaptive, data-driven, and student-centered smart campuses.

Keywords: *Agentic AI, College Administration, Smart Campus, Scheduling, AI Governance*

ECO-FRIENDLY EDGE AI SYSTEMS USING SOC, FPGA,AND ICROCONTROLLER-BASEDPLATFORMS

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Abstract: Edge AI systems are implemented using these three fundamental platform types: System-on-Chip (SoC), Field-Programmable Gate Array (FPGA), and Microcontroller (MCU). An SoC is a complete computing system on a single piece of silicon. For Edge AI, the most critical component is often an integrated NPU, a specialized accelerator designed from the ground up to efficiently execute the matrix math underpinning neural networks, facilitating the process of running complex AI models (like vision transformers or LLMs) alongside a full operating system and managing peripherals like cameras and displays in the making of smart cities. The real-world example for SOC is Ambrella's N1-655 System-On-Chip, which has the efficiency to execute large language models with up to 8 billion parameters while simultaneously processing 12 video streams with the striking feature of a low-power budget of just 15 watts. This is a prime example of high-performance, power-efficient edge processing. In essence, SoCs offer the best balance of performance and ease of use for complex tasks, FPGAs provide unparalleled flexibility and low latency for custom pipelines, and MCUs enable intelligence at the lowest power and cost points. Since the best choice is the one that best aligns with the dynamic need of every individual project requirement. The technological convergence of the SoC, FPGA, and microcontroller-based platform, which can form the technological confluence, will facilitate the sustainable ubiquitous computing platform.

Keywords: **System-on-chip, FPGA, MCU platform, edge AI, ubiquitous computing, multi-sensor platform, and smart cities.**

EXPLAINABLE AI-BASED DISEASE PREDICTION

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Abstract: Early and accurate disease detection remains a critical challenge in modern healthcare systems. Artificial Intelligence (AI) has emerged as a powerful tool for supporting clinical decision-making; however, many high-performing machine learning and deep learning models operate as opaque black-box systems. Although these models deliver strong predictive results, their lack of interpretability restricts clinical trust and limits widespread adoption in real-world healthcare environments. This study proposes an explainable AI-based disease prediction framework that integrates predictive performance with transparency. Machine learning algorithms are applied to structured medical datasets to identify potential disease conditions at an early stage. To enhance interpretability, feature importance analysis is incorporated to reveal the key clinical factors influencing model predictions. The proposed approach emphasizes a balanced design that maintains model accuracy while improving transparency and addressing bias and ethical considerations in healthcare AI. Experimental findings demonstrate that explainable models can achieve performance comparable to conventional black-box systems while significantly strengthening interpretability and trust. By bridging the gap between predictive intelligence and clinical transparency, this research contributes to the advancement of responsible, trustworthy, and patient-centred AI solutions in healthcare

Keywords: Explainable Artificial Intelligence, Disease Prediction, Machine Learning, Healthcare Analytics, Model Interpretability

DEEP AUTO ENCODER AND HENON MAP-BASED MEDICAL IMAGE ENCRYPTION SYSTEM

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ABSTRACT : The confidentiality and integrity of the medical images have become an important requirement in current digital healthcare applications because of the rising number of cyber threats and data breaches. This paper proposes a hybrid multi-layer encryption scheme that combines representation learning using deep learning techniques with chaotic and symmetric encryption methods. A deep auto encoder is used to represent the medical images as compact latent vectors, which improve conceal and eliminated structural redundancy. The Henon chaotic map is used to produce highly sensitive and pseudo-random key sequences which improve resistance to statistical and differential attacks. To improve the cryptographic security of the proposed scheme the Advanced Encryption Standard (AES) algorithm is used as a secondary encryption layer. The performance of the proposed scheme is evaluated using the metrics such as PSNR, MSE, SSIM, and RMSE to evaluate the reconstruction reliability and security performance. The experimental results indicate that the proposed method achieves excellent image recovery accuracy, enhanced resistance to cryptanalytic attacks, and sensitivity to keys. The proposed strategy gives an effective and secure approach to store and transmit medical images in digital healthcare systems.

Keywords: Medical image encryption, Henon map, Healthcare, Chaotic encryption, PSNR, MSE, SSIM, RMSE, Advanced Encryption Standards.

SECURING THE MUTI-TENANCY ISSUE USING ZERO TRUST ARCHITECTURE

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Abstract: The growth of cloud computing in today's IT landscape has enabled the higher risks with the multi-tenant environments. In cloud scenarios, resources are shared among multiple entities which becomes a major concern in the security domain. The traditional security approach is no longer effective against threats that originate from within. This paper outlines an effective security solution based on Zero Trust Architecture (ZTA), which is tailored specifically to meet the requirements of multi-tenancy. This works tries to overcome two major security challenges. They are insider threats and virtualization vulnerabilities. To overcome these challenges, we propose for the implementation of dynamic Trust Algorithm that uses score-based weightage system and assess the trustworthiness of users and devices by computing a real-time Trust Score, thereby ensuring that access is never implicit and is always verified. This proposed approach integrates behavioural anomaly detection, monitoring and notifying on any variations from the established user Behavior patterns. The virtualization-level threats, shall be addressed with the usage of KVM (Kernel-based Virtual Machine) to ensure robust network and hardware segregation, which effectively block data breaches and unauthorized lateral movement among tenants. The proposed combination of detailed trust score with hardware isolation provides a comprehensive method for safeguarding shared cloud infrastructures, thus maintaining data integrity and tenant confidentiality in a multi-tenant environment.

Keywords: Multi-tenancy Cloud, Zero Trust Architecture, Cloud Security, Trust Algorithm, Kernel-based Virtual Machine, Hardware Isolation.

BLOCKCHAIN ATTENDENCE MANAGEMENT SYSTEM

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Abstract : Maintaining accurate and secure attendance records is an important task in educational institutions, but traditional attendance systems such as manual registers and centralized databases are often prone to errors, data manipulation, and proxy attendance. These systems lack transparency and security, which can lead to unreliable records and administrative difficulties. This project proposes a Block chain-Based Attendance Management System that provides a secure, transparent, and tamper-proof solution for recording and managing student attendance .The proposed system uses block chain technology to store attendance records as immutable transactions, ensuring that once the data is recorded it cannot be altered or deleted. Smart contracts are used to automate attendance recording and validation, which helps prevent duplicate entries and unauthorized modifications. The system uses cryptographic authentication methods to ensure that only authorized users, such as students and teachers, can access and update attendance information while maintaining data privacy.The system is implemented as a web-based application using HTML, CSS, and JavaScript for the front end, and Node.js, Express. js, and MongoDB for the back end. Block chain integration is achieved using Ethereum and Solidity smart contracts, with MetaMask used for secure user authentication and transaction verification.This Blockchain Attendance Management System improves reliability, transparency, and efficiency in attendance management. It reduces manual effort, prevents attendance fraud, and ensures accurate record keeping, making it a suitable solution for modern educational institutions.

Keyword: Blockchain ,tracking Cryptography , ethereum ,meta mask, remix IDE solidity, decentralized , Cryptocoin ,database

SMART CROP MANAGEMENT SYSTEM USING MACHINE LEARNING

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Abstract: Smart crop management is an important approach for improving agricultural productivity and ensuring sustainable farming practices. Traditional farming methods rely heavily on manual monitoring, which may lead to inefficient utilization of water, fertilizers, and other resources. This project proposes a machine learning–based smart crop management system that helps in making accurate and data-driven decisions. The model analyses various environmental and soil parameters such as soil moisture, temperature, humidity, rainfall, and crop type to provide recommendations for irrigation scheduling, usage, and crop health monitoring. Historical agricultural datasets are used to train and test the model for better prediction accuracy. The proposed system helps farmers optimize resource usage, reduce crop loss, and increase overall yield. This study contributes to the development of precision agriculture by integrating modern machine learning techniques into traditional farming practices.

Keywords

Smart agriculture, Machine learning, Crop prediction, Soil moisture, Precision farming, Irrigation management.

EMPIRICAL EVALUATION OF CHI-VEC INTEGRATED CONV-BILSTM MODEL FOR ENHANCED SENTIMENT ANALYSIS

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Abstract: Sentiment analysis (SA), the process of identifying and categorizing opinions expressed in textual data, plays a crucial role in understanding user sentiments across various domains like social media, e-commerce, and customer service. With the increasing volume of unstructured text data, deep learning (DL) has emerged as a powerful tool for SA due to its ability to automatically extract complex features and patterns. However, the high dimensionality and noise in raw data often lead to overfitting and increased computational costs, posing challenges for DL models. To address these limitations, an effective feature selection technique is needed prior to model training. This research proposes a fused feature selection method, Chi-VEC, which combines chi-square and word2vec to enhance the quality of input features. Additionally, we introduce a hybrid DL classifier, Conv-BiLSTM, which integrates Convolutional Neural Networks (CNNs) for feature extraction and Bidirectional Long Short-Term Memory (BiLSTM) for capturing contextual dependencies. The proposed Chi-VEC feature selection technique, combined with the Conv-BiLSTM model, significantly improves classification accuracy, and enhances generalization. Experimental results demonstrate that the integrated feature selection and hybrid classifier approach outperforms state-of-the-art models, establishing its effectiveness in robust SA.

Keywords: Sentiment Analysis, Feature Selection, Chi-VEC, Conv-BiLSTM

DUAL-IMAGE SUPER-RESOLUTION FOR OPTICAL SATELLITE IMAGES WITH BLIND QUALITY ASSESSMENT

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Abstract: Satellite imagery plays a critical role in remote sensing, mapping, agriculture, and surveillance applications. However, images captured by satellite sensors often suffer from low spatial resolution due to hardware limitations, atmospheric disturbances, and cost constraints. This paper proposes a Dual Image Super-Resolution (DISR) framework that enhances image quality by leveraging complementary information from two low-resolution satellite images of the same geographic region. The proposed system performs pre-processing and image alignment using feature-based registration techniques to ensure spatial consistency between inputs. Both interpolation-based enhancement methods and deep learning models are independently applied to generate high-resolution candidates. A fusion module integrates the outputs by selectively preserving sharper edges, finer textures, and structurally consistent details, resulting in improved reconstruction quality compared to traditional single-image super-resolution approaches. Since high-resolution ground-truth images are not always available in real-world scenarios, the system incorporates a blind image quality assessment module utilizing no-reference metrics such as NIQE, BRISQUE, and PIQE to evaluate reconstruction performance objectively. Experimental analysis demonstrates that the proposed dual-image fusion strategy improves visual clarity and structural detail while maintaining robustness across varying imaging conditions. The framework provides a practical and scalable solution for enhancing satellite imagery where reference data is limited, making it suitable for real-time remote sensing and geospatial applications.

Keyword—Dual Image Super-Resolution, Satellite Image Enhancement, Image Registration, Deep Learning, Image Fusion, Blind Quality Assessment.

FILTERING HEPATOCELLULAR CARCINOMA IMAGES: EVALUATIONS AND RECOMMENDATIONS

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Abstract : Hepatocellular carcinoma is a global health-threatening malignant tumor that needs to be diagnosed at an earlier stage. However, the MRI/CT/PET scan images and contrast-enhanced mammography images encompass noise in them; cleaning the images improves accuracy and helps segment the tumor efficiently. Automated analysis and enhanced visualization are accomplished by filtering the images. This research work focuses on the currently used different filtering algorithms, specifically Block Matching and 3D (BM3D), Adaptive Wiener, Non-Local Bayes (NL-Bayes), Hybrid-Bilateral Guided (Hybrid-BG), and Deep Median. The performance of the algorithms is assessed and compared on a real HCC dataset using the metrics PSNR, SSIM, and MSE. Moreover, PSNR is commonly used in denoising, SSIM is used to find the perceptual quality, and MSE is used for calculating the absolute error. Based on the evaluation, the Deep Median Filtering algorithm attained the magnum opus performance with 34.95 dB of PSNR and 0.6596 of SSIM performance with PSNR of 34.95 dB and SSIM of 0.6596, indicating higher stability to transient noise and efficacious hierarchical multi synaptic feature extraction. With the PSNR value of 31.17 dB, the hybrid bilateral-guided filter is the second-best algorithm, with perfect edge preservation challenging for tumor boundary recognition. The optimal filtering technique for HCC imaging is the deep median filter. In the future, algorithms with the best metrics will be integrated and used with the medical field and verify their results on diagnostic precision.

Keywords: Hepatocellular Carcinoma (HCC), Block Matching and 3D Filter, Adaptive Wiener filter, Non-Local Bayes (NL-Bayes) Filter, Hybrid –Bilateral Guided (Hybrid-BG) Filter, Deep Median Filter.

A COMPUTATIONAL FRAMEWORK FOR SIMILARITY-BASED REASONING AND DATA ANALYTICS

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Abstract: Similarity serves as a cornerstone of computer science, artificial intelligence, and data science, yet the concept of similarity intelligence, the active process of deriving intelligence through the identification of likeness, has been largely neglected as a standalone discipline. This paper formalizes similarity intelligence as a critical framework that functions alongside experience-based, knowledge-based, and data-driven intelligence. By investigating the intersection of Similarity-Based Reasoning (SBR), similarity computing, and advanced analytics, this study illustrates how these processes transform raw comparisons into actionable insights. The research introduces three distinct similarity-based inference rules and evaluates a multiagent SBR system to demonstrate the practical application of this intelligence in real-world scenarios. Ultimately, the paper provides a dual contribution by situating similarity intelligence within a broader hierarchy of cognitive processes and offering a methodology that enhances the development of machine learning, case-based reasoning, and autonomous intelligent agents. This research establishes that similarity is not merely a mathematical metric but a foundational form of intelligence that bridges the gap between raw data and structured knowledge. By integrating similarity intelligence with existing data-based and knowledge-based frameworks, we enable a more nuanced approach to artificial intelligence that mirrors human experience. The introduction of specific inference rules and a multiagent SBR system provides a practical roadmap for researchers to implement these concepts.

Keywords: *Similarity intelligence, Similarity computing, Similarity analytics, Similarity-Based reasoning, Artificial intelligence, Intelligent agents*

SURVEY ON EMOTIONAL INTELLIGENCE IN SPEECH RECOGNITION

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Abstract: Emotional intelligence add voice- based systems in such a way that machines not only recognize words, but start sensing and interpreting the feelings in someone's voice. When systems can sense emotion, we open the door for methods to use technology that are less cluttered or difficult and more naturally supportive and human. SER is a fast-emerging field, and its application in fields like customer service, healthcare, education and virtual assistants is already being actively investigated. In this study, new progresses in SER is examined, including modern deep learning models, multimodal approaches that combine speech with other signals, and techniques designed to work reliably in noisy, real-world environments.

The study also looks at commonly used datasets, how emotional cues are extracted from speech, and the practical barriers current systems still face. Drawing on these insights, it offers recommendations to guide future research and design, with the goal of enabling speech-based systems to respond in more empathetic, emotionally aware ways.

Keywords – Speech emotion recognition, emotional intelligence, deep learning, multimodal fusion, acoustic features, human–computer interaction.

AUTOMATING TASKS WITH PYTHON SCRIPTS

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Abstract: Automation improves accuracy, speed, and productivity in daily computer tasks. Python, a simple and powerful programming language, is widely used to automate activities such as sending emails, renaming files, web data extraction, report generation, and system scheduling. This project, "Automatic Task with Python Script," aims to reduce manual effort, save time, and avoid human errors by using Python libraries like Os, shutil, smtplib, requests, and schedule. The system allows users to execute tasks automatically at scheduled times and can be customized for different needs. Python-based automation is cost-effective, flexible, and highly useful in areas like data processing, system maintenance, and business workflows. This project demonstrates how automation makes computer tasks faster, smarter, and more efficient.

Keywords: Python, Automation, Task Scheduling, Scripting, Efficiency, Productivity, File Management, Data Processing, Web Automation, System Operations.

USED CAR PRICE PREDICTION MODEL: A MACHINE LEARNING APPROACH

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Abstract: The impact of the Covid-19 pandemic over the past two years has slowed down the economy, including the market of used cars. However, the recent decline in the number of cases infected with Covid-19 has reignited interest in the used car market. One of many persisting issues found in the used car market is that sellers want the highest price possible; but, buyers and used car dealers bid the lowest price due to economic stability uncertainty. To accelerate the recovery of the used car industry, various innovations are required. This study proposes the use of the K-Nearest Neighbours (KNN) regression model to predict used car prices to address this issue. The proposed KNN model is a machine learning algorithm which is capable of handling multi- dimensional data and its robustness to noisy data, making it suitable for predicting used car prices based on multiple factors. By analysing collected data on used car prices, a machine learning- based regression model can be developed to predict used car prices based on factors commonly used in the used car industry, such as year of production, car type, car condition, and others. This study makes use of 504 used car data collected through web scraping as a secondary data collection method. With a relatively small error rate of 8.3% and an R2 value of 98.8%, the results of this analysis can provide insight for used car buyers and sellers, to better gauge the price of used cars in the market.

Keywords: Used Cars, Machine Learning, Multiple Linear Regression, Polynomial Regression, K-Neighbors Regression.

INVESTIGATION OF PRESSURE-GRADIENT EFFECTS ON FREE CONVECTIVE MHD HEAT AND MASS TRANSFER ALONG A VERTICAL PLATE IN A POROUS MEDIUM USING THE NEW MODIFIED DIFFERENTIAL TRANSFORM–DECOMPOSITION METHOD

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Abstract: This study applies a recently developed New Modified Differential Transform–Decomposition Method to derive analytical solutions for an unsteady magneto-hydrodynamic flow of a **Non-Newtonian fluid** past an infinite vertical plate. The plate is embedded in a porous medium and exposed to a uniform transverse magnetic field, while the induced magnetic and electric fields are neglected. Thermal radiation effects are assumed insignificant, and the model incorporates a heat sink together with a first-order chemical reaction to account for heat and mass transfer mechanisms. A **Pressure Gradient** term is included in the momentum formulation to investigate its contribution to the velocity distribution and related transport characteristics. No-slip boundary conditions are imposed at the plate. The obtained solutions are assessed by comparing them with available Laplace transform results reported in earlier literature. Parametric effects on velocity, temperature, and concentration profiles are examined using two-dimensional graphical illustrations by MATLAB. In addition, the responses of skin friction, Nusselt number, and Sherwood number to variations in the controlling parameters are discussed. The outcomes demonstrate that the proposed method can be implemented directly for the associated boundary-value problem and provides accurate closed-form solutions.

Keywords:

New Modified Differential Transform–Decomposition (NMDT-D) technique, Magneto hydrodynamic (MHD) flow, porous medium, coupled heat and mass transfer, heat sink.

VEGIL AI

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Abstract: Vegil AI – Proactive Urban Safety Through AI-Enhanced CCTV Monitoring is an intelligent surveillance system designed to detect violent activities, suspicious behaviour, falls, assaults, and public safety threats in real time using AI-powered video analytics. Modern cities rely heavily on CCTV cameras, yet human monitoring is limited by fatigue, slow reaction time, and large-scale deployments. Vegil AI bridges this gap through automated, high-speed, and high-accuracy analysis of live CCTV feeds. The system integrates YOLOv8, Ultralytics, motion-based heuristics, and threat-level classification algorithms to detect activities like fighting, physical assault, public conflicts, falls, unusual crowd behaviour, and weapon-like objects. Once detected, the system instantly triggers an automated alert workflow that includes threat visualization, frames of evidence, timestamps, GPS/camera location, and API-based notification to emergency responders. The system architecture combines the following components: Live Video Capture AI-based Person & Pose Detection Behaviour Analysis & Violence Classification Threat-Level Engine Automated Alert API Dashboard for Monitoring Vegil AI enhances urban safety by reducing response time, minimizing manual oversight load, and providing predictive insights. It contributes to public safety frameworks, smart city ecosystems, and emergency preparedness through real-time AI surveillance technology. Future enhancements include multi-camera tracking, predictive modelling, firearm detection, gait- based anomaly recognition, cloud-based deployment, and integration with city-level emergency networks.

Keywords: AI-Enhanced CCTV Surveillance, Real-Time Violence Detection, YOLOv8-Based Video Analytics, Urban Public Safety Monitoring

AI-Enabled Smart Rescue Network for Borewell Emergency Situations

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ABSTRACT : India is a husbandry- grounded country, drovers or growers principally calculate generally upon groundwater for their introductory water frame conditions. The farmers are digging the borewell for water. But, they left open and uncovered. So that, most in far of kiddies concur-rently moves toward the well and falls into it. There's a definite need for developing a security and deliverance system for children to deliver from drag well. The drag well cases have taken numerous lives of innocent children while playing in that area. AI Enabled Smart Rescue Network for Bore-well Emergency Situation is a software grounded deliverance System that uses a wireless camera to Cover a child trapped inside a borewell. The camera takes the child emotions. The System uses the VGG16 deep leaning model. VGG16 (Visual Geometry Group – 16 Layers). In this 13 Layers are Convolutional Layers and 3 Completely connected Layers. It's uses to descry the feelings of the child. Grounded on this analysis, the System can identify conditions similar as fear, wrathfulness, happy, neutral, sad and nausea.

KEYWORDS : *VGG16, 13 Convolutional Layers, 3 Fully connected Layers, Emotion Detection, Emergency Response System.*

DL-IDF: A Resilient Deep Learning Methodology for Securing Industrial IoT Networks

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Abstract— Industrial Internet of Things(IoT) is widely recognized field that allows to connect all devices. It works in a process of gathering data, data exchange, and runs automatically. It mainly involves automation tasking without any human intervention, which results high efficiency and less amount of costs. However IoT results for good monitoring and tracking real-time insights, it also has the cons that make IoT in high danger that leads to cyber attacks as the devices are interconnected. To overcome this issue we present a deep learning based hybrid framework integrating Deep Neural Networks (DNN) with Extreme Learning Machine (ELM) to make Internet of Things more secure. Extreme Learning Machine (ELM) is a one step training approach that gives high accuracy which is a good and practical approach. In this proposed system we analyze data by extracting a NSL-KDD dataset which is trained to resolve the duplication of data and uneven distribution of data issues present in the previous intrusion detection dataset and present the accuracy of each model. Unlike compared to existing models in this proposed system we also present the differences of each training model and justify why ELM is the best fitted and chosen to execute for a dataset. After the completion of the execution of a dataset it is again valuated for error prone results such that if any wrong predictions and estimations are present they are rectified. This proposed system strengthens all the flaws of the existing methods and gives us a path for managing the remaining challenges.

Keywords— Industrial Internet of Things, Deep Learning, Extreme Learning Machine(ELM), Cyber Threats, NSL-KDD dataset, Real Time Monitoring, Accuracy.

Deep Semantic Matching of Stack Overflow Questions Using Word2Vec and Neural Networks

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Abstract: The growth of community-based query answering platforms such as Stack Overflow has led a way to raising duplicate questions, creating redundancy and reduced answer retrieval efficiency and content quality. Manually identifying duplicate question is time consuming and also needs experienced users. Traditional methods based on lexical similarity have mostly failed to cover the semantic gap between syntactically varying but semantically corresponding queries. The new system proposes a same semantic matching system that systematizes duplicate question detection utilizing Word2Vec and neural network architectures. This proposed system preprocesses input data and changes textual content into semantic representations applying Word2Vec. These pre-processed data is then processed via Convolutional Neural Network (CNN), Recurrent Neural Network (RNN), and Long Short-Term Memory (LSTM) models to capture contextual relationships between ques-tion pairs. Performance evaluation is done on metrics like accuracy and recall, with analysis across different models. The results provide an expandable, automated solution for optimizing knowledge management in large-scale technicalities.

Keywords: Duplicate Question Detection, Semantic Similarity, Word2Vec, Deep Learning, Convolutional Neural Network (CNN), Recurrent Neural Network (RNN), Long Short-Term Memory (LSTM), Natural Language Processing (NLP), Question Matching, Stack Overflow.

Unleashing the Power of Agentic AI in Revolutionizing Healthcare Management

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ABSTRACT : Agentic AI is revolutionizing healthcare through autonomous decision making, enhancing patient care, operational efficiency, and diagnostic accuracy. This shift allows AI not only to analyze the data but also initiate actions like ordering tests, adjusting medication dosages, scheduling appointments that leads to improved patient care. Healthcare organizations that adopt agentic AI can gain a competitive edge in efficiency and patient satisfaction. This paper deals with proposing an agentic AI driven model that predicts the patient inflow and outflow data analysis in healthcare by enabling the systems to autonomously analyze and act on data. Poorly managed patient flow often leads to overcrowding of healthcare settings, which in turn results in adverse clinical outcomes and diminished patient experiences. Agentic AI-driven patient flow management solutions are designed to anticipate and track patient movement across the continuum of care, from admission through discharge. Beyond predicting admissions and transfers, these AI tools can also enhance patient volume forecasting by automating and optimizing appointment scheduling.

KEYWORDS: Agentic AI, healthcare, patient inflow, appointment scheduling, automation

BREACH DEFENDER: A UNIFIED LAYERED SYSTEM FOR DATA BREACH PREVENTION

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ABSTRACT: The increasing frequency and sophistication of cyberattacks have exposed signifi-cant limitations in traditional standalone security mechanisms. Static firewalls alone cannot detect evolving attack patterns, while intrusion detection systems often operate passively without immediate mitigation capabilities. This paper presents *BreachDefender,* a unified layered security framework designed to enhance real-time data breach prevention through a defense-in-depth approach. The proposed system integrates firewall-based traffic filtering, IDS-driven anomaly detection, and honeypot-based deception techniques within a single architecture. The system is implemented using a VirtualBox environment consisting of an Ubuntu Server acting as the Defender and a Kali Linux system simulating the Attacker within an isolated internal network. The firewall layer enforces strict packet filtering, port restriction, and rate limiting to block unauthorized access attempts. The virtual environment ensures safe, reproducible attack simulations such as port scanning and brute-force attempts without affecting real-world networks. The proposed approach emphasizes foundational security layers by combining virtualization isolation with proactive prevention mechanisms. Experimental validation demonstrates effective containment of malicious traffic and reduction of attack surface. This framework provides a practical, scalable, and research-oriented solution suitable for academic laboratories and enterprise security testing environments.

KEYWORDS: Cybersecurity, Virtualization, Firewall, Honeypot, Network Security, Intrusion Detection System(IDS)

PAPER PRESENTATION ON EMPLOYEE ATTENDANCE API

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ABSTRACT: The Employee Attendance System API is designed to provide a structured and efficient way to manage employee information and track daily attendance within an organization. This system exposes RESTful endpoints to perform core operations such as employee registration, attendance marking, and retrieval of attendance records based on employees or specific dates. The application models a one-to-many relationship where a single employee can have multiple attendance records, ensuring data normalization and relational integrity. Built using Spring Boot and Spring Data JPA, the system demonstrates effective handling of entity relationships, date-based filtering, and custom database queries. Attendance status is maintained using predefined constants (PRESENT/ABSENT) to ensure data consistency. The API enables seamless interaction between client applications and the backend, supporting scalable and maintainable attendance management. This project emphasizes practical implementation of REST APIs, relational database mapping, and query optimization, making it suitable for real-world enterprise applications.

KEYWORDS: *Attendance Management, API, Employee Management, Java Persistence API, REST, Spring Boot, Spring Data.*

COUNTERFACTUAL CAUSAL EXPLAINABLE AI FOR EARLY INTERVENTION IN AUTISM SPECTRUM DISORDER USING BEHAVIORAL AND CLINICAL FEATURES

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Abstract : Autism Spectrum Disorder (ASD) is a complicated neurodevelopmental disorder that is associated with the disabilities in communication, social interaction, and behavioral patterns. Early diagnosis is very important to make the intervention effective; the traditional methods of diagnosis are usually subjective, time-consuming, and rely on the expert review. This paper presents a causality-based explainable machine learning model to predict early ASD on behavioral screening data. It is a set of 1054 cases comprised of 19 variables, namely Autism Quotient (AQ) scores, Qchat score, and clinical variables: family history and developmental indicators. The framework proposed is an integration of data preprocessing, correlation analysis, machine learning classification, and causal inference, to give each a predictive performance and interpretability. Random Forest and XGBoost ensemble models are used in order to obtain high classification accuracy, whereas the structural causal modeling approach is used to determine causal relationships between key variables and ASD outcomes. According to experimental findings, experimental findings show that behavioral features, especially the Qchat score and select AQ attributes, have a high level of influence on the prediction of ASD (some of them have strong causal effects).They are further improved by visualization, such as heatmaps, ROC curves, and feature distribution plots. The given approach offers clinically significant information, unlike a traditional black-box model where it is not possible to distinguish between correlation and causation. The framework enhances credibility and facilitates the process of decision making during early screening of ASD. This paper identifies the opportunities of integrating machine learning, causal inference, and explainable AI to design reliable and interpretable healthcare solutions.

Keywords: *Autism Spectrum Disorder (ASD), Causal Inference, Random Forest, XGBoost, Qchat Score.*

AUTOMATED SIGN LANGUAGE INTERPRETER USING GESTURE RECOGNITION

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ABSTRACT: Communication barriers between speech- and hearing-impaired individuals and the general public remain a significant challenge in achieving inclusive interaction. Sign language is the primary mode of communication for the deaf and mute community; however, its interpretation by nonsigners is limited. An automated system capable of translating sign language gestures into speech or text can effectively bridge this communication gap and enhance accessibility.

This paper presents a supervised machine learning–based approach for real-time automated sign language interpretation using gesture recognition techniques. The proposed system captures hand gestures through a camera interface and processes them using image acquisition, preprocessing, segmentation, feature extraction, and classification modules. Background subtraction and K-means segmentation are applied to isolate the hand region from complex environments. Geometric features such as contour area, convex hull, solidity, aspect ratio, and finger angle measurements are extracted to improve gesture representation and classification performance.

Two recognition methods—Template Matching and the proposed Pixel Count algorithm—are implemented and comparatively evaluated. System performance is measured using evaluation metrics including accuracy, precision, recall, and execution time. Experimental results indicate that the Pixel Count–based method achieves higher recognition accuracy with reduced computational complexity compared to conventional approaches. Recognized gestures are converted into corresponding audio output, enabling effective real-time communication.

The study demonstrates the effectiveness of machine learning in developing scalable, costeffective assistive technologies that promote social inclusion and improved human–computer interaction.

Keywords: *SignLanguage, GestureRecognition, MachineLearning, SupervisedLearning, PixelCount, TemplateMatching, ImageProcessing, RealTimeSystem, AssistiveTechnology, HumanComputerInteraction, Classification, Segmentation, ConvexHull, FeatureExtraction, TensorFlow, Accessibility*

A REVIEW OF VOICE NOTE BRAILLE USING AI

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ABSTRACT: Voice-to-Braille conversion systems have gained increasing attention due to their potential to bridge the gap between spoken language and tactile output. This review presents research conducted between 2019 and 2025 on speech recognition, Braille translation, and Braille printing technologies. The study categorizes existing approaches into software-based transcription systems, portable and low-cost embossers, IoT-enabled printers, and AI-driven multilingual models. Key performance aspects such as transcription accuracy, hardware design, affordability, and tactile permanence are analyzed. The review identifies persistent challenges including limited multilingual capability, slow embossing speed, mechanical durability issues, and lack of end-to-end system integration. Based on the comparative analysis, the paper emphasizes the need for a unified, scalable, and cost-effective voice-driven Braille printing system that integrates artificial intelligence with reliable hardware mechanisms. This review aims to guide future research toward the development of inclusive and practical solutions for visually impaired users.

Keywords: Assistive Technology , Voice-to-Braille Conversion , Speech Recognition , Braille Translation , Tactile Outpu

CREDIT CARD FRAUD DETECTION IN TRANSACTION DATA

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ABSTRACT: The project entitled as "CREDIT CARD FRAUD DETECTION IN TRANSACTION DATA" aims to design an automated system to efficiently detect irregularities in transaction data, enhancing fraud prevention and financial security. With the rapid growth of digital transactions, traditional methods are inadequate, making intelligent anomaly detection essential. The framework includes data preprocessing, feature extraction, and multiple detection methods such as Z-score, IQR, and moving average, integrated through an ensemble voting mechanism for higher accuracy. A real-world-like dataset with injected anomalies is used to evaluate performance, achieving a precision of 84%, recall of 76%, and F1-score of 0.80. This modular and scalable system ensures adaptability for banking, e commerce, and digital payment platforms. Future improvements may integrate advanced machine learning and real-time analytics for enhanced accuracy and speed.

Keywords: *Anomaly Detection, Data Preprocessing, Ensemble Learning, Financial Security, Fraud Prevention, Machine Learning, Moving Average, Transaction Data.*

"MALAYALAM HANDWRITTEN RECOGNITION: A COMPREHENSIVE REVIEW"

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Abstract: Malayalam is one of the most extensive character sets among Indian languages, featuring vowels, consonants, unique "Chillu" characters (pure consonants), and vowel-consonant signs. The intricate design of many characters often leads to similar shapes, presenting challenges for classifiers to differentiate them accurately. In natural handwriting, characters frequently touch or overlap, complicating algorithms' ability to establish clear boundaries. The curved and nonlinear strokes that define Malayalam add to the complexity of feature extraction. Each person has a distinct writing style, with variations in stroke thickness, pressure, and speed, resulting in considerable differences for the same character. This detailed review emphasizes offline recognition of Malayalam handwritten characters and text, where input is typically sourced from digitized paper documents. Initial research relied on handcrafted features—statistical, structural, and directional—paired with traditional classifiers like k-nearest neighbors, Support Vector Machines, and Hidden Markov Models. Recently, there has been a shift toward deep learning-based models for recognizing Malayalam handwriting. These modern techniques often employ hybrid models to effectively handle the script's complex morphology and high inter-class similarities. They integrate Convolutional Neural Networks (CNNs) for automatic spatial feature extraction and Bidirectional Long Short-Term Memory (BiLSTM) networks to capture sequential dependencies. Depthwise Separable Convolutions (DSC) are utilized to lower computational costs and reduce parameter sizes while ensuring high accuracy. Furthermore, transfer learning with fine-tuned models such as AlexNet and ResNet is increasingly used to accelerate training on large character sets.

Keywords: - *Malayalam handwritten recognition, offiine handwritten documents, convolutional neural networks, bidirectional LSTM, transfer learning*

AI-DRIVEN STRATEGIC TROOP DEVELOPMENT AND DEPLOYMENT RECOMMENDATION SYSTEM FOR INTELLIGENT MILITARY DECISION SUPPORT

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Abstract: Strategic troop planning and deployment play a critical role in modern defense operations, where timely, accurate, and intelligent decision-making is essential to ensure mission success while minimizing casualties and resource loss. Conventional troop deployment strategies largely depend on manual assessment and historical experience, which often fail to effectively adapt to dynamic battlefield environments and real-time uncertainties. To address these limitations, this paper proposes an AIdriven Strategic Troop Development and Deployment Recommendation System designed to provide intelligent, data-driven tactical support for military decisionmakers. The proposed framework integrates artificial intelligence, predictive military analytics, and secure tactical computing to analyze diverse operational parameters, including terrain conditions, weather patterns, mission urgency, enemy threat levels, troop capabilities, and historical mission data. Based on these inputs, the system generates optimized troop deployment strategies, recommends appropriate unit configurations, and estimates mission success probability using advanced machine learning models. Furthermore, a real-time analytical dashboard is incorporated to enhance situational awareness through intuitive visualization of risk zones, deployment efficiency, and resource utilization. Experimental results demonstrate significant improvements in planning accuracy, response time, and strategic reliability compared to conventional rule-based approaches. The system offers a scalable, secure, and adaptable framework suitable for modern defense infrastructures. Future enhancements include the integration of computer vision for automated battlefield perception and reinforcement learning for continuous strategy optimization, enabling the development of intelligent and autonomous military decision-support platforms.

Keywords: *Strategic Troop Planning, AI-Driven Decision Support, Predictive Military Analytics, Autonomous Mission Planning, Secure Tactical Systems*

AUTOMATIC ESTIMATION OF FRACTAL DIMENSION OF COMPLEX STRUCTURES USING A WEB-BASED BOX-COUNTING FRAMEWORK

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Abstract: Many natural and mathematical structures such as coastlines, tree branches, biomedical signals, and fractal patterns show irregular and self-similar behaviour that cannot be properly described using classical Euclidean geometry. Fractal geometry provides a meaningful way to measure such complexity through fractal dimension. However, most existing tools for estimating fractal dimension are limited in flexibility, difficult to use, or designed only for specific datasets. In this work, we present a web-based system for automatic estimation of fractal dimension of complex structures. The system allows users to upload images or signals and processes them through a simple computational framework. The input is converted into a binary representation, and a multi-scale box-counting method is applied. The fractal dimension is then calculated using a log-log relationship and presented along with graphical plots for better understanding.

The system is tested on different datasets such as natural images, biomedical signals like ECG, and mathematical fractal patterns including the Mandelbrot set. The results obtained are consistent and close to theoretical values. The proposed system is simple, reliable, and easy to use, making it suitable for students and researchers. It can be applied in mathematics, image processing, environmental studies, and biomedical signal analysis for measuring structural complexity.

Keywords: *Fractal Dimension; Box-Counting Method; Web-Based System; Image Processing; Biomedical Signal Analysis*

CLOUD-CONNECTED SOLAR POWER MONITORING SYSTEM USING ESP8266

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Abstract : The Effective and intelligent monitoring systems are now required to maintain optimal energy generation and identify issues in real time due to the increasing increase of solar PV installations. Typical monitoring methods need costly infrastructure and frequently lack remote accessibility. In this research, an IoT Cloud communication protocol and an ESP8266 microcontroller are used to create a cloud-connected solar power monitoring system. Using an Internet of Things cloud, the system continuously monitors the voltage, current, temperature, and power output of solar panels. It then sends the data to a cloud platform for real-time analysis and visualization. An improved solar monitoring and data collecting system must be developed in order for solar energy to become widely adopted as a major alternative to conventional energy sources due to the growing need and awareness for using sustainable and efficient energy resources. This study introduces a solar monitoring system that will track data in real time on a number of solar panel parameters, offering insights into how to keep the output of the solar panels productive and efficient. The model is based on a rooftop solar panel at a college, which consists of two solar PV panels connected in series. The sensing elements for the system are chosen based on the panel's parameters and specifications. Through the use of a microcontroller, these sensing devices send data to a cloud for storage after detecting the various system characteristics at a predetermined period. In parallel, an IOT platform is used to show the data for the users. The study's model of the monitoring system was tested throughout the day at different times, and the desired result was obtained. The microcontroller that powers this system is a Wi-Fi-capable module that allows for data representation and storage. Remote monitoring is made possible by smart solar monitoring and data acquisition systems, which give operators real-time access to data so they may make well-informed decisions quickly for applications involving intelligent energy management, the suggested approach provides scalable integration, dependable communication, cheap deployment costs, and decreased bandwidth use.

Keywords : Internet of Things (IoT), Liquid Crystal Display(LCD), PV (Photo Voltaic Solar Panel),ESP8266 Wi-Fi – Module.

INTELLIGENT CAREER GUIDANCE SYSTEM USING RULE-BASED AI AND DATA-DRIVEN INSIGHTS

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Abstract : Choosing an appropriate career path is a complex decision that significantly impacts an individual's professional development. Many students face difficulty in selecting suitable careers due to limited awareness, lack of structured guidance, and rapidly changing industry demands. Traditional career counselling methods often lack personalization, scalability, and continuous performance evaluation. This paper presents the design and implementation of an Intelligent Career Guidance System using a rule-based Artificial Intelligence framework supported by data-driven insights. The system integrates aptitude testing, RIASEC personality assessment, and skill proficiency classification to generate personalized and explainable career recommendations. It also performs skill gap analysis to identify missing competencies and provides structured learning roadmaps to enhance career readiness. An AI-powered chatbot offers contextual guidance on interview preparation, resume optimization, and job search strategies. By prioritizing transparency and reliability over complex blackbox models, the proposed system delivers an accessible, scalable, and interpretable solution that bridges the gap between academic preparation and industry requirements.

Keywords: *Career Guidance System, Rule-Based AI, Skill Gap Analysis, Career Recommendation Engine, RIASEC Assessment, Explainable AI, Job Market Analytics, Resume Optimization, Educational Technology, Decision Support System*.

AI BASED PSYCHOMETRIC ANALYSIS

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Abstract : The increasing complexity of modern corporate environments and the shift toward remote work have created a significant demand for integrated tools that balance operational productivity with employee mental well-being. Traditional monitoring systems often focus solely on active hours, leading to workplace stress and a lack of actionable health data. This paper presents MindForge, a premium AI-driven suite built on the Electron framework, designed to automate productivity tracking and mental stability assessment through a non-intrusive, stealth-oriented architecture. The system utilizes a 3-tier Multi-Tenant Role- Based Access Control (RBAC) model to ensure strict data isolation between different organizations, maintaining a "Privacy Wall" via Firebase security rules. For productivity monitoring, the application employs a background service in the Electron main process that captures active window titles every 60 seconds and utilizes the Gemini API for automated categorization and scoring. Simultaneously, the system conducts multimodal mental wellness tests using webcam sentiment analysis and voice-to-text integration, where a context-aware AI generates dynamic follow-up questions based on user responses. The application features a premium Glassmorphism interface built with React 19 and Tailwind CSS, providing users with detailed feedback while offering managers high-level stability trends without compromising raw personal data. Powered by an efficient combination of cloud-based AI and local system-level monitoring, the system is highly scalable and customizable, supporting future enhancements such as predictive burnout analytics and persistent cloud-based data logging. This AI-driven solution minimizes human intervention in performance reviews, enhances organizational empathy, and offers a reliable, privacy-first approach to modern workforce management.

Keywords: *Employee Mental Health, Workplace Productivity, Emotion Detection, Voice Sentiment Analysis, Machine Learning, Random Forest, Desktop Application, Real-Time Monitoring, AI-Based Assessment, MindWell AI*

SIT-TANH: A STOCHASTIC THEORETIC AND EMPIRICAL STUDY OF A NEW ACTIVATION FUNCTION

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ABSTRACT: Activation functions are fundamental to the stability, expressivity, and generalization of deep neural networks. We introduce Scaled Inverse-Tanh (SIT-tanh), a novel parametric activation that smoothly interpolates between identity mapping and saturating nonlinearities. Through rigorous theoretical analysis, we show that SIT-tanh provides global Lipschitz control, preserves subgaussian concentration, contracts variance, and stabilizes gradient propagation across depth. Stochastic extensions further demonstrate robustness under weight noise and improved generalization bounds via Rademacher complexity contraction. Empirical evaluations on MNIST and CIFAR-10 confirm that SIT-tanh achieves competitive or superior accuracy compared to established activations such as tanh, ReLU, and Swish, while maintaining stable gradient norms and resilience to perturbations. Together, these results establish SIT-tanh as a principled activation family that unifies smoothness, boundedness, and tunable contraction, offering a robust alternative for both deterministic and stochastic deep learning architectures.

KEYWORDS: Scaled Inverse Tanh (SIT tanh), Lipschitz Continuity, Subgaussian Concentration, Rademacher Complexity.

AN INTELLIGENT RISK SCORING FRAMEWORK FOR FRAUD DETECTION IN ONLINE FINANCIAL TRANSACTIONS

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ABSTRACT: There is a large-scale expansion of online payment platforms and most of the digital transactions are prone to fraud. The major focus of this project is to use the risk score mechanism to identify the fraudulent activities. When a transaction is made, the system will immediately examine if the transaction is fraudulent or not by analyzing all the factor like transaction amount, risk conditions , location, transactions frequency. All these factors are used to calculate the risk score and this score is used to automatically decide whether to approve the transaction or decline the transaction or mark the transaction for manual review by admin. In existing system, it is difficult to identify the new fraudulent patterns and lacks in efficiency. This will generate high false positives and reduces the accuracy. The proposed system implements a multi-factor intelligent risk scoring model which evaluates the risk more effectively. It classifies the transactions into low, medium and high risk categories. This improves the decision quality. Special verification model is also implemented where sensitive transactions like hospital payments to detect the bill mismatches and make the corresponding decisions. Technologies like React with TypeScript, Vite, Node.js are used to develop this system. The output includes the dashboard that contains transaction ID, user name, risk score, final decision made, fraud alert notification through an interactive interface. It visually shows the donut chart which represents Risk Score Distribution, the detection efficiency chart for representing security outcome ratio. bar graph for showing category density , and time series graph for neural drift and velocity. It will minimize the human errors by ensuring consistency across all the transactions. It improves overall integrity of online payment platforms, more secure transactions.

Keywords: *Risk score mechanism, Fraudulent activities, Fraud alert notification, Neural drift and velocity*

WEBCAM-BASED DRIVER DROWSINESS DETECTION USING DEEP LEARNING TECHNIQUES

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ABSTRACT: Driver drowsiness is a critical contributor to fatigue-related traffic incidents, significantly impairing reaction time, perception, and decision-making ability. Conventional driver monitoring systems rely on vehicle behavior analytics or intrusive physiological sensors, which either lack direct behavioral interpretation or impose practical constraints for large-scale real-world deployment. This study presents a real-time, non-contact driver drowsiness detection framework that formulates fatigue assessment as a temporal facial behavior modeling problem using deep learning. Dense three-dimensional facial landmarks are extracted through Mediapipe FaceMesh to capture fine-grained ocular, oral, and head pose dynamics. Fatigue-sensitive descriptors, including dynamic Eye Aspect Ratio trajectories, blink duration sequences, Mouth Aspect Ratio variations, and head orientation transitions, are computed and structured as temporal feature streams. A hybrid Convolutional Neural Network–Long Short-Term Memory (CNN–LSTM) architecture is designed to jointly learn discriminative spatial facial representations and sequential fatigue progression patterns across consecutive frames. Experimental evaluation under varying illumination conditions and head movements achieved an overall classification accuracy of 94.2% with an average inference latency below 40 ms per frame, enabling real-time deployment. A lightweight monitoring interface supporting automated alert generation further demonstrates operational feasibility. The proposed framework offers a scalable, robust, and practically deployable solution for intelligent invehicle driver state monitoring and advanced transportation safety systems.

Keywords: *Driver drowsiness detection, Deep learning, CNN–LSTM, Facial landmark analysis, Real-time monitoring*

SMARTVISION: AI-DRIVEN IRIS BIOMETRIC ATTENDANCE & WORKFORCE AUTHENTICATION SYSTEM

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ABSTRACT: This project presents a secure and automated Smart Vision – AI-based workforce attendance system designed to enhance workforce authentication and attendance tracking in organizational environments. The system leverages computer vision and biometric recognition techniques using a technology stack comprising Python, OpenCV, MediaPipe, NumPy, Flask, and MySQL to ensure accurate, contactless, and tamper-resistant employee attendance recording. The core functionality involves real-time iris detection through a camera interface, where unique iris patterns are captured, processed, and stored in a structured database during employee enrollment. To prevent duplicate registrations, the system implements iris feature comparison and validation mechanisms that restrict multiple entries of the same biometric identity. During attendance marking, the live iris image is matched against the stored templates to authenticate employees and log their presence with timestamps in an attendance database. The application is deployed as a web-based platform using Flask, enabling secure user and administrator login with role-based access control. Administrators can manage employee records, view attendance logs, generate reports, and monitor system usage, while authorized users can perform enrollment and attendance operations. The system also addresses long-term biometric variability by supporting re-enrollment for senior employees whose iris pat-terns may degrade over time, ensuring sustained recognition accuracy. Attendance logs and analytical reports are maintained in a MySQL database, allowing efficient retrieval, auditing, and workforce analysis. By integrating biometric identification, liveness detection, duplicate prevention, and role-based administration into a unified architecture, the proposed solution offers a reliable, scalable, and secure alternative to traditional attendance methods such as RFID cards or fingerprint scanners. This iris-based attendance system demonstrates the practical application of computer vision and biometric authentication in enterprise attendance automation, improving accuracy, preventing impersonation, and reducing manual intervention in employee management processes.

Keywords: *Iris Recognition, Biometric Authentication, AI–Based Attendance System, Computer Vision, Duplicate Prevention, Access Control System.*

ARTIFICIAL INTELLIGENCE BASED COMPARATIVE ANALYSIS OF NORMAL ANTS AND ZOMBIE ANTS USING MATHEMATICAL INFECTION MODELING

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ABSTRACT: The phenomenon of zombie ants caused by the parasitic fungus Ophiocordyceps unilateralis represents one of the most extraordinary examples of behavioral manipulation observed in biological ecosystems. The fungus infects carpenter ants and progressively invades internal tissues, ultimately altering neuromuscular functions and forcing abnormal behavioral responses such as vegetation climbing and mandibular locking behavior before death. Although biological studies extensively describe this infection cycle, computational modeling and automated classification systems remain limited. This research proposes an Artificial Intelligence based comparative framework to distinguish normal ants and zombie ants using mathematical infection modeling and supervised machine learning techniques. A structured dataset was generated using biologically inspired parameters including infection severity, locomotion degradation index, and morphological deformation score. Logistic regression was employed to estimate infection probability using sigmoidbased modeling. Model performance was evaluated using accuracy metrics, ROC curve analysis, and confusion matrix validation. Experimental results demonstrate strong classification performance with minimal misclassification rates. This interdisciplinary study bridges parasitology and computational intelligence, offering a scalable foundation for automated ecological monitoring and biological anomaly detection systems.

AI-DRIVEN CAREER GUIDANCE SYSTEM FOR STUDENTS

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ABSTRACT : Choosing the right career path is one of the most important decisions in a student's life. However, many students struggle due to lack of proper guidance, awareness about career options, and understanding of their own strengths and interests. Traditional career counseling methods are often manual, generalized, and may not provide personalized recommendations.

The proposed **AI-Driven Career Guidance System for Students** aims to solve this problem by using Artificial Intelligence and Machine Learning techniques to analyze student data such as academic performance, skills, interests, and aptitude levels. The system processes this information and provides personalized career recommendations that align with current industry trends and job market demands. By integrating data-driven decision-making, the system minimizes human bias and enhances accuracy in career suggestions. It can also suggest suitable courses, certifications, and skill development programs to improve employability. The proposed solution helps students make informed career choices, improves confidence, and bridges the gap between education and employment.

This AI-based system ensures smarter, faster, and more reliable career guidance, contributing to better academic planning and long-term professional success.

CLOUD-NATIVE DATA ENGINEERING: PERFORMANCE BENCHMARKING OF BIG DATA TOOLS IN AWS AND GOOGLE CLOUD

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ABSTRACT: The rapid evolution of cloud-native technologies has significantly transformed modern data engineering, creating the need for structured frameworks to evaluate performance and scalability across distributed cloud environments. This study presents a systematic benchmarking framework for analysing big data tools deployed on Amazon Web Services and Google Cloud Platform. The proposed approach focuses on measuring core performance indicators while addressing challenges related to workload variability and dynamic resource allocation. The research evaluates batch and real-time data processing workloads under varying data volumes, examining execution time, throughput, and autoscaling efficiency. Containerized deployments and Kubernetes-based orchestration are utilized to ensure consistency and fairness in cross-platform comparisons. The framework further analyses resource utilization and service stability under controlled stress conditions to assess operational reliability. Experimental observations reveal performance variations influenced by scaling mechanisms and infrastructure configurations. The findings provide practical insights for designing efficient and scalable cloud-native data pipelines. By establishing a standardized benchmarking methodology, this research supports informed decision-making in selecting and optimizing big data services across cloud platforms. Ultimately, the study contributes to improving performance transparency and operational effectiveness in next-generation cloud-based data engineering environments.

Keywords: *cloud-native data engineering, performance benchmarking, big data analytics, multi-cloud computing, AWS, Google Cloud Platform, scalability, distributed processing, Kubernetes, cloud performance.*

INTEGRATED DEEP LEARNING FRAMEWORK FOR WATER DEMAND FORECASTING AND LEAKAGE DETECTION

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ABSTRACT : In rapidly expanding urban areas, forecasting urban water demand is an essential part of sustainable water resource planning. Precise medium-term demand forecasting facilitates efficient decision-making concerning infrastructure development, conservation tactics, and supply management. However, complex temporal patterns found in urban water consumption data are frequently missed by traditional statistical forecasting techniques. Using historical urban water consumption data, this paper suggests a deep learning-based method for zone-level monthly water demand forecasting. A Long Short-Term Memory (LSTM) network is used in the suggested methodology to efficiently model temporal dependencies in time-series data. Normalization and sliding window transformation are two common preprocessing methods used before model training. The suggested model's performance is assessed against conventional baseline forecasting techniques using common forecasting metrics like Mean Absolute Error (MAE), Root Mean Square Error (RMSE), and Mean Absolute Percentage Error (MAPE). According to experimental findings, the deep learning method improves forecasting robustness and accuracy for medium-term urban water demand prediction. The developed forecasting model serves as a foundational component for future integration with leakage detection mechanisms within a unified deep learning framework for intelligent water management systems.

Keywords: Water demand forecasting, Deep learning, LSTM, Urban water management, Time series forecasting

SMART DIET RECOMMENDATION SYSTEM FOR LIFESTYLE DISEASES

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ABSTRACT: The increasing prevalence of lifestyle diseases such as diabetes, hypertension, obesity, and heart-related conditions has created a strong need for personalized dietary guidance. This project presents a Smart Diet Recommendation System that uses machine learning techniques to suggest appropriate diet plans based on individual health parameters. The proposed system collects user inputs including age, disease condition, physical activity level, weight, height, and gender through a user-friendly web interface developed using Flask and Bootstrap. The system calculates the Body Mass Index (BMI) to assess the user's health status. Categorical inputs are encoded and processed using a trained Random Forest Classifier model to predict the most suitable diet plan. The model also provides a confidence score indicating the reliability of the recommendation. The application aims to provide quick, automated, and personalized diet suggestions to support healthy lifestyle man-agement. Compared to traditional rule-based systems, the proposed machine learning approach im-proves adaptability and prediction capability. The system is lightweight, scalable, and can be further enhanced by incorporating larger datasets and additional health parameters. Overall, the Smart Diet Recommendation System demonstrates the effective use of artificial intelligence in preventive health-care and personalized nutrition planning

CYBER-SECURE SATELLITE VIGILANCE: PROTECTING VULNERABLE POPULATIONS FROM DIGITALLY- FACILITATED VIOLENCE AND ABUSE

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ABSTRACT: This innovative system utilizes satellite technology to protect human lives, particularly vulnerable populations such as children and women, from violence, abuse, and exploitation. By leveraging satellite surveillance and advanced analytics, the system can detect early warning signs of potential threats and send real-time notifications to authorities, enabling swift intervention and protection. The system aims to prevent human rights violations, reduce the risk of harm, and promote a safer environment for all. With its potential to save lives and prevent abuse, this satellite-based solution can be a game-changer in the quest for human protection and dignity. By providing critical support to law enforcement and humanitarian organizations, the system can help ensure justice and accountability for perpetrators, while empowering communities to take action against human rights abuses. Ultimately, this system has the potential to make a significant impact on the lives of millions, promoting a culture of safety, respect, and protection for all.

Key words: *Violence, Abuse, Exploitation, Leveraging harm.*

NETWORK TRAFFIC MONITORING SYSTEM USING MACHINE LEARNING

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ABSTRACT: Network security plays a crucial role in protecting organizational data and ensuring uninterrupted services. With the increasing number of cyber threats, traditional monitoring systems are no longer sufficient to detect advanced attacks. This project focuses on developing a Network Traffic Monitoring System using Machine Learning to enhance network security and threat detection. The proposed system analyzes network packet data and traffic flows to detect anomalies in real time. By studying patterns in normal network behavior, the machine learning model can identify unusual activities such as Distributed Denial of Service (DDoS) attacks, intrusions, and other malicious actions. The system uses classification algorithms trained on network datasets to differentiate between normal and abnormal traffic. These algorithms learn from historical traffic data and continuously improve detection accuracy. When suspicious behavior is detected, the system generates alerts for administrators to take immediate action. The primary objective of this project is to minimize network downtime, prevent data breaches, and improve overall system reliability. By implementing intelligent traffic monitoring, organizations can enhance their cybersecurity posture and respond quickly to potential threats.

XAI-POWERED MULTILINGUAL FAKE NEWS DETECTION USING TRANSFORMER MODELS

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ABSTRACT: The rapid spread of misinformation across digital platforms poses a serious threat to public trust, social stability, and informed decision-making. This challenge becomes more complex in multilingual environments, where linguistic diversity and cultural variations reduce the effectiveness of traditional machine learning approaches. This paper presents an Explainable Artificial Intelligence (XAI)–powered multilingual fake news detection system based on Transformer architectures. Multilingual Transformer models such as XLM-R are employed to capture deep contextual and cross-lingual semantic representations of news content. To address the black-box nature of deep learning models, explainability techniques are integrated to highlight influential words and phrases contributing to classification decisions. Experimental analysis demonstrates that the proposed approach achieves improved accuracy, robustness, and interpretability compared to conventional TF-IDF and machine learning–based systems. The system is suitable for real-time deployment through a web-based interface or API, supporting global fact-checking and misinformation control efforts. In addition, the system includes proper data cleaning and language detection to handle news articles written in different languages or mixed-language formats. The Transformer models are fine-tuned on the dataset to improve performance and reduce overfitting. The explainability module helps users clearly see why a news article is classified as real or fake by highlighting important words in the text. This improves transparency and builds trust in the system. The proposed framework is designed to be scalable and can be integrated into social media platforms, news websites, or fact-checking tools for real-time misinformation detection.

KEYWORDS: *Fake News Detection, Multilingual NLP, Explainable AI, Transformer Models, mBERT, XLM-R.*

NOISE-RESILIENT STOCK PREDICTION USING A MAMBA–TRANSFORMER HYBRID MODEL

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ABSTRACT: Stock market forecasting is inherently challenging due to high volatility, noisy price movements, and the influence of unpredictable external events such as news and investor sentiment. Conventional deep learning models often struggle to distinguish meaningful trends from noise, resulting in unstable predictions during volatile market conditions. This paper proposes a noise-resilient hybrid framework that integrates a Mamba-based state-space model with a Transformer encoder to improve robustness and predictive accuracy. The Mamba component efficiently captures stable sequential patterns from historical price data, while the Transformer focuses on contextual understanding of event-driven information and sentiment. By combining both representations, the proposed system provides reliable next-day stock trend predictions even in noisy environments. Experimental evaluation using standard error metrics demonstrates improved stability and performance compared to single-architecture models, making the framework suitable for real-world financial decision support. Furthermore, the proposed framework incorporates technical indicators and sliding-window sequence generation to enhance feature representation and temporal consistency. The model is evaluated on real-world stock market data collected from the National Stock Exchange (NSE), including major companies across multiple years. Comparative analysis against LSTM and standalone Transformer models confirms the effectiveness of the hybrid design in reducing prediction error and improving robustness during periods of high volatility.

KEYWORDS: *Stock Market Prediction, Mamba Model, Transformer, Noise Reduction, Deep Learning, Financial Time Series*

A REVIEW OF ARTIFICIAL INTELLIGENCE IN STEM HIGHER EDUCATION

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ABSTRACT: Artificial Intelligence (AI) is transforming higher education by enhancing the teaching and learning of Science, Technology, Engineering, and Mathematics (STEM) disciplines through innovative and technology-supported approaches. This review paper presents recent developments in STEM education and explains how AI-driven technologies, learning analytics, and modern pedagogical practices contribute to improved learning experiences in higher education. This review paper focuses on integrated STEM education, active and collaborative learning models, digital learning environments, and AI-based educational technologies, including machine learning, educational data mining, and intelligent tutoring systems. The findings discussed in this review paper demonstrate that AI-supported learning provides personalized feedback, performance prediction, adaptive instruction, and real-time academic guidance, which strengthen student engagement, conceptual understanding, and teaching effectiveness. The review paper further emphasizes the role of AI-based tutoring and analytics systems in supporting educators and promoting interactive, learner-centered STEM environments. This review paper highlights the growing potential of AI technologies to complement traditional teaching methods and advance accessible, effective, and technology enhanced STEM education in higher education.

Keywords: *Artificial Intelligence, STEM Education, Learning Analytics, Intelligent Tutoring Systems, Machine Learning, Higher Education, Adaptive Learning.*

AI CODE UNDERSTANDING PLATFORM USING AST – BASED STATIC ANALYSIS

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ABSTRACT: The rapid rise of AI-powered code generation has significantly accelerated software development however, developer comprehension has not progressed at the same pace. Engineers often face challenges in understanding AI-generated logic, hidden dependencies, and complex multi-file architectures. The AI Code Understanding Platform addresses this gap by introducing an architectural analysis layer over source code. Using AST-based static analysis, the system extracts structural components such as classes, functions, imports, and call relationships without executing the code. This extracted information is presented through interactive dashboards and dependency graphs, enabling clear visualization of system structure and execution flow. Additionally, an AI-powered explanation layer provides grounded and context-aware insights to assist in onboarding, validation, debugging, and architectural review. By integrating structural analysis with intelligent assistance, the platform significantly enhances code understandability and supports scalable comprehension in modern AI-driven development environments.

Keywords: *AI, Code Understanding, Static Analysis, Abstract Syntax Tree (AST), Software Architecture, Dependency Graphs, AI-Generated Code, Developer Productivity, Program Comprehension, Intelligent Systems.*

A REVIEW OF GAMIFIED LEARNING PLATFORM FOR SCHOOL STUDENTS

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ABSTRACT: Gamification has become an important approach in modern education, especially in digital and online learning environments, as it helps make learning more interesting and interactive for students. This review paper shows that gamification can improve student motivation, participation, and learning experiences when it is thoughtfully designed and applied. Game elements such as points, badges, levels, and rewards encourage students to stay engaged and actively involved in their learning activities. Gamification has been successfully used in learning management systems, mobile learning apps, online discussions, and classroom teaching, where it has helped improve collaboration, academic performance, and learner satisfaction. It also creates a more enjoyable and meaningful learning environment by encouraging active participation, building confidence, and helping students stay focused on their learning goals. In addition, gamification supports self-paced learning where students can learn according to their own abilities and speed, and it helps students develop problem-solving skills and independent learning habits. This review paper highlights, gamification supports a more interactive and student-centered approach to education, making the learning process more effective and motivating for learners.

Keywords: *Gamification, Student Motivation, Learning Engagement, Personalized Learning.*

AN EXPLAINABLE HYBRID DEEP LEARNING FRAMEWORK FOR MULTI-STAGE DIABETIC RETINOPATHY DETECTION

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Abstract: Diabetic Retinopathy (DR) is a leading cause of preventable blindness among individuals with diabetes and requires accurate multi-stage grading for timely clinical intervention. Manual assessment of retinal fundus images is time-consuming and dependent on specialist expertise, making large-scale screening challenging. This study presents an explainable hybrid deep learning framework for automated five-stage DR classification using retinal fundus images. The proposed model integrates EfficientNetV2 and Vision Transformer (ViT) to capture both fine-grained lesion features and global retinal structural patterns. Feature representations from both architectures are fused to enhance classification robustness and stability. The model was evaluated on the APTOS 2019 Blindness Detection dataset using an 80:20 training and testing split and achieved an overall accuracy of 94.3%, outperforming standalone CNN and Transformer models. To improve clinical interpretability, Grad-CAM++ was employed to generate visual heatmaps highlighting diagnostically relevant retinal regions influencing predictions. A Streamlit-based web application with automated PDF report generation was also developed to enable real-time screening and tele-ophthalmology support. The proposed framework demonstrates a scalable, interpretable, and deployable solution for multi-stage diabetic retinopathy detection.

Keywords: *Diabetic Retinopathy, Hybrid Deep Learning, EficientNetV2, Vision Transformer, Explainable AI, Grad-CAM++, APTOS 2019 Dataset, Medical Image Analysis.*

A NOVEL CHARACTERIZATION OF B^*_{CG} OPEN SETS VIA CLOSURE GRILL

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ABSTRACT : This paper introduces a new structure in topological spaces, called closure grill and develops an associated operator. We B^*_{CG} open sets in a grill topological space and provide examples to illustrate the concept. The properties of these sets are studied, including their behavior under arbitrary unions and finite intersections, with counterexamples. We also introduce B^*_{CG}-closure and interior, and discuss their relationships with various sets. Furthermore, almost B^*_{CG}sets and $R(X, Br^*_{CG})$ sets are introduced and their characterizations and properties are explored.

Keywords: *Grill, local function, local closure grill function,* B^*_{CG} *open sets, locally* B^*_{CG} *continuous function.*

OCR BASED AUTOMATIC EVALUATION OF DESCRIPTIVE ANSWERS USING LLM

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Abstract:

This project presents an OCR-integrated, LLM-based framework for automated evaluation of handwritten descriptive answers using a hybrid semantic–lexical representation approach. The system processes scanned handwritten answer sheets (image/PDF formats) through handwriting recognition to generate machine-readable text, followed by preprocessing including normalization, text cleaning and question–answer segmentation for precise alignment with reference solutions. A parallel feature extraction module computes semantic features via transformer-based embeddings and lexical features through surface-level similarity metrics and statistical indicators. These representations, along with raw text, questions, model answers and rubric descriptors, are fed into an LLM evaluation module via engineered prompts, producing rubric-aligned scores and detailed qualitative feedback. The system ultimately generates per-question feedback highlighting missing concepts, misconceptions and targeted improvement suggestions.

Keywords: *OCR, LLM, handwritten answers, semantic–lexical features, automated evaluation, rubric scoring, student feedback.*

NEAR MEMORY COMPUTING FOR EDGE AIOT

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ABSTRACT: Edge AIoT devices face power and latency constraints. This project explores Near Memory Computing to optimize performance for Edge AIoT applications. By processing data closer to storage units, the system reduces data movement energy costs. This architecture accelerates AI inference tasks on resource-constrained devices. The methodology involves designing memorycentric computing structures. The objective is to enhance efficiency and speed for IoT sensors. Results show reduced latency compared to traditional von Neumann architectures. This innovation supports real-time processing in smart homes or industries. Ultimately, Near Memory Computing enables scalable, energy-efficient AI deployment at the edge, overcoming bottlenecks in current hardware designs for next-generation intelligent IoT ecosystems.

A COMPREHENSIVE SURVEY ON MACHINE LEARNING TECHNIQUES FOR SECURITY AND ANOMALY DETECTION IN BLOCKCHAIN NETWORKS

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ABSTRACT: Blockchain technology helps record digital transactions in a secure and transparent way. It removes the need for a central authority and stores data in a distributed network. Even though blockchain is secure, it is still affected by problems such as fraud, double-spending, 51% attacks, money laundering, and smart contract attacks. Because blockchain networks generate a large amount of data, it is difficult to manually detect suspicious activities. Machine Learning (ML) techniques help in automatically identifying unusual or harmful behavior. This paper provides a simple and clear survey of ML methods used for detecting security threats and anomalies in blockchain networks. It discusses different types of ML models, common challenges, evaluation methods, and future research directions.

KEYWORDS: *Machine Learning, Blockchain, Security, Anomaly Detection*

MEDIVIA - SMART HOSPITAL MANAGEMENT SYSTEM

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ABSTRACT: MEDIVIA – Smart Hospital Management System is a full-stack web application designed to digitalize and simplify hospital operations by integrating multiple healthcare services into a single platform. The main objective of the system is to efficiently manage patients, doctors, appointments, pharmacy services, medical reports, and emergency alerts through a secure and user-friendly interface. The system provides OTP-based user registration and JWT authentication to ensure secure access. MEDIVIA supports role-based dashboards for four major roles: Patient, Doctor, Pharmacy, and Admin. Patients can book appointments using an appointment slot system, view medical records, and download PDF medical reports generated using Report Lab. Doctors can manage appointments and patient details, while pharmacy users can handle medicine-related information. The admin module offers complete control over hospital resources such as departments, doctors, pharmacy management, and analytics dashboards for monitoring system activities. The application is developed using React JS for the frontend and Django REST Framework for the backend, with MySQL as the database for storing hospital records securely. By automating hospital workflows and improving accessibility, MEDIVIA enhances the overall efficiency of healthcare management and reduces manual paperwork.

Keywords: *Smart Hospital Management, Appointment Booking System, Role-Based Access Control, React Full Stack Application, Emergency Alert System, Healthcare Digitalization.*

RADIUS PROBLEMS FOR TWO-VARIABLE BESSEL FUNCTIONS UNDER FRACTIONAL DIFFERENTIAL OPERATORS

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ABSTRACT : In this work, we investigate the geometric aspects of the two-variable Bessel function under the influence of a fractional differential operator of order δ>0. The radius of starlikeness, convexity, and uniform convexity in the bidisc is sharply characterised, and we provide precise representations for the fractional transform. The resulting solutions offer new links between fractional calculus and special functions and extend conventional one-variable geometric function theory to multiple complex variables (SCV). Additionally, numerical examples are discussed.

Keywords: *Bessel function, Starlike function, convex function, uniform convexity, Fractional Differential Operator*

AI-BASED COUNSELLING APPOINTMENT MANAGEMENT SYSTEM

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ABSTRACT: This project focuses on developing an intelligent psychological assistance and appointment management system using Artificial Intelligence and Machine Learning technologies. The system is designed to help users analyze psychological patterns, detect cognitive distortions, and provide personalized recommendations while also allowing users to book counselling appointments efficiently. The backend of the system is developed using AI and ML models integrated with a server-side application, while the frontend is built using HTML, CSS, and JavaScript to provide an interactive and user-friendly interface. The system also ensures secure data handling and smooth communication between frontend and backend components. The application uses a relational database to store user details, appointment schedules, and system-generated results. The system integrates machine learning models to provide intelligent suggestions based on user input and behavioural data. The appointment booking module prevents duplicate bookings and ensures efficient session management. Overall, the project demonstrates the practical implementation of AI with web technologies to build a scalable, real-time psychological assistance platform that can be used in healthcare, counselling centers, or mental wellness applications.

Keywords: *Artificial Intelligence, Machine Learning, Psychological Analysis, Cognitive Distortion Detection, Web Application, Appointment Booking System, Mental Health Technology, Data Analysis, Full Stack Development, Database Management, Predictive Analytics, Counselling Support System*

FARMGUARD –CROP DISEASE DETECTIONUSING CNN

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ABSTRACT: The project entitled "FarmGuard: Crop Disease Detection Using ConvolutionalNeural Network (CNN)" aims to develop an AI-based systemthat automaticallydetects and classifies plant diseases from leaf images. Cropdiseasessignificantly affect yield and productivity, and traditional detection methodsareoften slow and expensive. The system uses a CNN model trained on36plantclasses to provide fast and accurate predictions. The Flask backendhandlesprocessing, while MongoDB stores user and disease data. Asimplewebinterface built with HTML, CSS, and JavaScript enables farmers touploadimages and get instant results. With an accuracy of over 92%, FarmGuardoffersan efficient, accessible, and scalable solution for early crop disease detection.

Keywords: *Agriculture, Artificial Intelligence, Convolutional Neural Network (CNN), Deep Learning, FarmGuard, Flask, Plant Disease Detection*

HYBRID FINANCE-INFORMED KOLMOGOROV–ARNOLD NETWORKS FOR EUROPEAN OPTION PRICING

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Abstract: Recent advances in physics- and finance-informed neural networks have demonstrated strong potential for solving differential equation–based problems in computational finance, particularly in option pricing. However, purely data-driven models often lack financial consistency, while purely constraint-based methods may suffer from slow convergence and instability. In this work, we propose a hybrid supervised–finance-informed Kolmogorov– Arnold Network (KAFIN) framework for European option pricing. The proposed approach integrates supervised learning with governing financial constraints derived from the Black– Scholes partial differential equation, enabling the model to learn both data-driven and theory consistent representations. A comparative analysis is conducted with standard multilayer perceptron models and purely finance-informed networks. Experimental results show that data-driven neural networks achieve reasonable approximation but exhibit larger errors in nonlinear regions near the strike price. Purely finance-informed models demonstrate improved consistency but slower convergence.

The proposed hybrid framework overcomes these limitations by achieving significantly higher accuracy, improved stability, and faster convergence compared to both approaches, while maintaining adherence to financial principles. These findings highlight the effectiveness of combining physics-based constraints and data-driven learning and demonstrate the potential of Kolmogorov–Arnold networks for robust financial modeling, risk analysis, and real-world derivative pricing applications.

Keywords: *Finance-Informed Neural Networks, Kolmogorov–Arnold Networks, Hybrid Learning, European Option Pricing, Computational Intelligence*

GRAPH-DOMINATED COMPUTING: A SURVEY OF TOPOLOGICAL APPROACHES FOR NEXT-GENERATION DIGITAL SYSTEM DESIGN

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ABSTRACT : The increasing complexity of modern digital systems, from multi-core processors to Networks-on-Chip (NoCs), demands robust theoretical frameworks for design, analysis, and optimization. This article explores the synergistic relationship between graph theory and computer organization, arguing that graph-theoretic concepts, particularly those involving structural domination and mapping, are becoming foundational to digital system innovation. We review classical applications, such as Boolean function minimization and state machine representation. Subsequently, we delve into advanced and emerging paradigms, including the hardware mapping of algorithms onto reconfigurable architectures (e.g., honeycomb FPGAs), the use of Prüfer sequences for lossless circuit-graph encoding, hypergraph-based NoC optimization, and graph-embedding techniques for layout minimization. This survey positions graph theory not merely as a tool for analysis, but as a dominant design principle shaping the future of high-performance, low-power, and specialized digital computer organization.

Keywords: *Domination, Digital Principles, Network-on-Chip (NoC), Graph Embedding, Logic Synthesis*.

HYBRID SWARM-DRIVEN FEATURE SELECTION WITH ENSEMBLE LEARNING FOR SOFTWARE DEFECT PREDICTION

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ABSTRACT: Many previous projects depended on conventional Machine Learning models to detect the defects. This old method may be SINGLE METHOD or a HYBRID MODEL; the features aren't correctly selected and without hyper-parameter refinement. The methods also enlarge the model scale and add meaningless features. This project informs you that how can the software quality be improved and development cost get decreased. In this project, first data preprocessing is done, feature selection is applied, machine learning classifiers are trained and are refined using optimized hyperparameters. The datasets are balanced using SMOTE (Synthetic Minority Over Sampling Technique) before training the models. Particle Swarm Optimization (PSO), Genetic Algorithm (GA) and Ant Colony Optimization (ACO) are integrated for optimal feature subset selection, while model hyperparameters are tuned using randomized search optimization. This project uses ensemble learning techniques such as Random Forest, Gradient Boosting and Voting Classifier these help in improving prediction stability, and it reduces overfitting. This proposed model is robust in nature and it is a reliable prediction model. This proposed model is resilient and it is a impressive prediction model. An approach is proposed for improving the software quality on a higher level. It is cost efficient in software development process. So instead of having features that do not relate to class, the model gets better at training on both classes resulting in more balanced defect detection. The proposed model achieves higher accuracy, F1-Score, Recall and precision compared to the conventional machine learning models.

Keywords*—Software Quality improvement, Machine Learning, Ensemble Learning, Classification models, Swarm Intelligence*

SMART SOUND-TO-TEXT EMOTIONAL TONE CONVERTER USING CNN FOR ACCESSIBLE COMMUNICATION

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Abstract: Deaf and hard-of-hearing individuals often face challenges in understanding not just spoken words but the emotions behind them. This study proposes a real-time Smart Sound-to-Text Emotional Tone Converter that transcribes speech into readable text and simultaneously identifies the speaker's emotional state. Using Convolutional Neural Networks (CNNs) applied to audio spectrograms, the system detects emotions such as happiness, sadness, anger, fear, surprise, and neutrality. The recognized emotions are visually indicated alongside the text, enabling users to comprehend both the content and the emotional context of conversations. Experimental results on benchmark emotional speech datasets demonstrate that the approach is effective, providing an accessible solution that enhances communication for the deaf community.

Keywords: *Deaf and Hard-of-Hearing, Emotion Recognition, Speech-to-Text, Convolutional Neural Networks (CNN), Audio Spectrograms, Real-Time System, Emotional Speech Dataset, Assistive Communication.*

MACHINE LEARNING ASSISTED OBJECT MONITORING SUPPORTED BY UWOC FOR IOUT

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ABSTRACT: This literature survey examines recent research developments in underwater communication and intelligent monitoring systems with emphasis on Underwater Wireless Optical Communication (UWOC), Internet of Underwater Things (IoUT), and deep learning–based object detection techniques. The reviewed studies analyze advancements in high-speed optical data transmission aimed at overcoming the bandwidth and latency limitations of traditional acoustic communication. Several works focus on energy-efficient routing protocols to enhance the operational lifetime and reliability of underwater sensor networks. In addition, computer vision approaches, including convolutional neural networks and advanced YOLO architectures, have been explored for underwater object detection, marine species identification, and real-time monitoring. Image enhancement techniques have also been investigated to address visibility challenges caused by light absorption and scattering in underwater environments. Hybrid communication frameworks and security mechanisms have been studied to improve connectivity and data protection. The survey highlights key performance improvements in detection accuracy, bandwidth efficiency, and network stability, while also identifying challenges such as limited transmission range, computational complexity, hardware constraints, and dataset limitations. Overall, this review provides a structured understanding of recent technological progress and research gaps in intelligent underwater monitoring systems.

Keywords: *Underwater Wireless Optical Communication (UWOC), Internet of Underwater Things (IoUT), Underwater Object Detection, Deep Learning, Energy-Eficient Routing.*

ADVANCES IN AI-DRIVEN MEDICINAL PLANT IDENTIFICATION: A REVIEW OF MACHINE AND DEEP LEARNING APPROACHES

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ABSTRACT: Automated medicinal plant identification through image analysis plays a vital role in strenthening traditonal healthcare practices, and preserving biodiversity. However, accurate identification of medicinal plant species remains challenging due to morphological similarities between species, seasonal variations, and limited availability of domain experts. This review paper presents a analysis of various machine learning and deep learning approaches used for medicinal plant identification, highlighting the technological advances ranging from Convolutional Neural Networks (CNNs) to Vision Transformer (ViT)–based architectures. This study examines commonly used datasets, feature extraction techniques, model performance and key challenges reorted in recent research. Furthermore, it discusses emerging trends, provides an overview of computational intelligence and identifies research gaps and future directions for developing robust, scalable and real time medicinal plant identifictaion systems. These findings can help researchers select suitable deep learning and machine learning models for medicinal plant identification and support further development of automated systems for research and healthcare applications.

Keywords: *Medicinal Plant Identification, Deep Learning, Medicinal Plant Species, Machine Learning*

EV CHARGING STATION DEMAND PREDICTION

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ABSTRACT:- Electric vehicles are becoming very popular in India, but the number of charging stations is not growing in a planned way. In many places, charging stations are either too crowded or not used properly because they are installed without proper analysis. This creates inconvenience for EV users and slows down EV adoption. To solve this problem, this project uses data and Machine Learning to find the best locations for installing new EV charging stations. The system studies different factors such as how many people live in an area, how heavy the traffic is, how many electric vehicles are already present, how many charging stations already exist nearby, how far the nearest station is, and how many offices, malls, or public places are around. Using this information, a Machine Learning model (Random Forest) is trained to decide whether a particular location really needs more EV charging stations or not. The model clearly classifies each area as either a high-demand location or a low-demand location. To make the system easy to use in real life, the model is connected to a simple web application. Anyone can enter location details into the app and instantly know whether that area requires a new charging station. This project shows how Machine Learning can be used from start to end from collecting data and training a model to deploying it as a realtime application and helps support smart city planning and eco-friendly transportation in India.

Keywords: *Electric Vehicles, Charging Infrastructure, Demand Prediction, Machine Learning, Random Forest, Smart Transportation.*

DESIGN OF AN AUTONOMOUS AI-DRIVEN FIRMWARE DEFENSE ARCHITECTURE WITH QUANTUM-SAFE ZERO-TRUST ENFORCEMENT FOR SECURE ISOLATED SYSTEMS

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ABSTRACT: The rapid evolution of cyber threats has shifted attacks from software applications to the firmware layer, enabling persistent and stealthy system compromise. At the same time, the emergence of quantum computing threatens traditional cryptographic mechanisms, risking long-term data confidentiality and integrity. This paper proposes an Autonomous AI-Driven Firmware Defense Architecture that integrates quantum-safe cryptography with a zero-trust security framework for isolated and network-restricted systems. The architecture embeds an intelligent firmware-level senti-nel capable of real-time behavioral analysis, anomaly detection, and autonomous containment. A quantum-resistant secure boot mechanism and hardware root-of-trust ensure integrity from system initialization, while encrypted LAN-only communication and continuous trust validation protect even air-gapped environments. Experimental simulations demonstrate improved detection accuracy and reduced attack persistence compared to conventional models. The proposed framework enhances resilience and provides a scalable, future-ready blueprint for securing embedded systems and critical infrastructure.

Keywords: *Firmware Security, Autonomous Cyber Defense, Zero-Trust Architecture, Post-Quantum Cryptography, Secure Boot, AI-Based Threat Detection, Air-Gapped Systems, Embedded System Security.*

SENTIMENT ANALYSIS OF SOCIAL MEDIA TEXT USING NLP AND MACHINE LEARNING

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ABSTRACT: The rapid growth of social media platforms such as Twitter, Facebook, and Instagram has generated massive volumes of user-generated textual data, reflecting public opinions, emotions, and attitudes toward products, services, events, and social issues. Extracting meaningful insights from this unstructured data requires advanced Natural Language Processing (NLP) and Machine Learning (ML) techniques. This study presents a comprehensive framework for sentiment analysis of social media text using NLP-based preprocessing and supervised machine learning algorithms.

The proposed approach involves data collection through social media APIs, followed by text preprocessing steps such as tokenization, stop-word removal, stemming, and vectorization using techniques like TF-IDF and word embeddings. Various machine learning classifiers, including Naïve Bayes, Support Vector Machines, and Logistic Regression, are trained and evaluated to categorize text into positive, negative, and neutral sentiments. The study highlights the practical applications of sentiment analysis in business intelligence, brand monitoring, political analysis, and public opinion tracking. The proposed framework provides a scalable and efficient solution for analyzing large-scale social media data and transforming textual content into actionable insights.

Keywords: *Sentiment Analysis, Natural Language Processing (NLP), Machine Learning, Text Mining, TF-IDF, Naïve Bayes, Logistic Regression.*

MODELLING STUDENT INFORMATION LITERACY THROUGH LEARNING BEHAVIOURS USING MACHINE LEARNING

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Abstract: Predicting student performance in information literacy courses before summative assessments remain a significant challenge in educational data mining. This study proposes a machine learning pipeline that leverages Learning Management System (LMS) interaction logs to forecast final grade outcomes for 320 undergraduates enrolled in a sixteen-week information literacy course at a Chinese university. Twenty-three behavioural features spanning resource-access patterns, quiz attempts, discussion participation, assignment-submission timing, and information-thinking task scores were extracted from LMS records. Pearson correlation filtering reduced the feature set to twelve high-signal variables, preserving model interpretability. Six classifiers were evaluated under a com-mon protocol: Decision Tree, k-Nearest Neighbours, Naive Bayes, Multi-Layer Perceptron, Random Forest, and XGBoost. Grade prediction was framed as a four-class problem (Excellent, Good, Pass, Fail) rather than a binary outcome to provide finer-grained insight into student risk levels. Random Forest achieved 92.50% accuracy with a Cohen's Kappa of 0.859 and a recall of 94.81%, while XGBoost outperformed all models with 93.00% accuracy, 95.10% recall, and an F1 score of 91.00%. Feature importance analysis identified information-thinking tasks and active application exercises as the dominant predictors, whereas passive resource-access frequency ranked comparatively low. These findings suggest that instructional designs emphasising active synthesis tasks over reading-list expansion produce more predictable and improved literacy outcomes. The proposed pipeline operates on standard hardware using publicly available Python libraries, making it a low-barrier tool for LMS-based institutions seeking early, data-driven intervention strategies.

Keywords: *Information Literacy; Learning Behaviour Analytics; Machine Learning; Educational Data mining; Random Forest; XGBoost*

AUTOMATED SCAM MESSAGE DETECTION USING TEXT ANALYSIS AND MACHINE LEARNING

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ABSTRACT: The rapid increase of scam messages through SMS and online platforms poses a significant threat to digital communication, causing financial loss and compromising personal data. Many users are unable to reliably distinguish fraudulent messages from genuine ones, which increases their vulnerability to cybercrime. To address this challenge, this project proposes an automated system for detecting scam messages using text analysis techniques and machine learning algorithms. The system processes the textual content of messages, extracting features such as keyword patterns, message structure, and contextual cues indicative of fraudulent intent. Using Python, machine learning models are trained on labeled datasets containing both scam and genuine messages to accurately classify incoming messages. When a new message is received, the system analyzes it in real time and provides an alert if it is identified as potentially fraudulent. This automation reduces the reliance on manual inspection, mitigates financial risk, and enhances user confidence in digital communication. By integrating text mining and predictive modeling, the proposed system provides a scalable and efficient solution for scam message detection. It enables users to quickly identify fraudulent messages, safeguards sensitive information, and contributes to safer online and mobile communication environments. This project demonstrates how AI-driven text analysis can enhance cybersecurity and protect users from evolving digital threats.

Keywords: *Scam Message Detection, Fraudulent Message Classification, Text Analysis, Machine Learning, Natural Language Processing (NLP), SMS Security.*

PHISHING WEBSITE DETECTION USING RANDOM FOREST ALGORITHM

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ABSTRACT: Phishing websites have become one of the most serious cyber threats, targeting internet users by imitating legitimate websites to steal sensitive information such as usernames, passwords, and financial details. With the rapid growth of online services, detecting phishing websites at an early stage is essential to ensure user safety and trust. Phishing Website Detection Using Random Forest Algorithm is a machine learning-based security system designed to accurately classify websites as legitimate or phishing. The system analyzes multiple website features such as URL structure, domain information, HTML and JavaScript characteristics, and page behavior patterns. The Random Forest algorithm, an ensemble learning technique, builds multiple decision trees and combines their outputs to improve detection accuracy and reduce overfitting. By learning from labeled datasets of phishing and legitimate websites, the proposed system can effectively identify malicious websites in real time. This approach provides a reliable, scalable, and efficient solution for enhancing cybersecurity and protecting users from online fraud.

KEYWORDS: *Phishing Website Detection, Random Forest Algorithm, Machine Learning, Cyber Security, URL Feature Analysis, Web Safety System.*

A COMPREHENSIVE REVIEW OF BAYESIAN RELIABILITY ESTIMATION FOR CONSECUTIVE K-OUT-OF-N:F SYSTEMS

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ABSTRACT : This review article presents a thorough evaluation of Bayesian reliability estimation methods for consecutive k-out-of-n:F systems, integrating the key contributions from the pivotal work by Madhumitha and Vijayalakshmi (2020). The consecutive k-out-of-n:F configuration rep-resents an important class of fault-tolerant systems widely used in telecommunications, oil pipeline networks, computer ring systems, and spacecraft relay stations. This review examines the Bayesian approach to reliability estimation when component lifetime data is limited, deriving exact reliability formulas, mean time to system failure (MTSF), and confidence intervals for both linear and circular configurations. The basic frame work, assumptions, and practical implications are discussed, along with numerical illustrations that demonstrate the superiority of Bayesian estimates over classical reliability approaches.

Keywords: *Bayesian reliability; consecutive k-out-of-n: F system; gamma distribution; mean time to system failure; confidence interval*

ENHANCING STOCK PRICE PREDICTION ACCURACY USING DEEP LEARNING MODELS AND HIDDEN MARKOV MODELS: A COMPARATIVE STUDY

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ABSTRACT: The financial market forms a critical part of the global economic framework, and therefore, accurate stock price predictions are paramount. This research work aims to evaluate the performance of different deep-learning models on the BSE dataset for predicting stock prices. This includes LSTM, CNN-LSTM, RNN, and their hybrid versions with Hidden Markov Models (HMM). Models were ranked based on key metrics: Mean Absolute Error (MAE), Mean Squared Error (MSE), Root Mean Square Error (RMSE), and R-squared. The results show that the LSTM-HMM model performed the best with the lowest MSE of 27,916.90, RMSE of 167.08, and a high R-squared value of 0.95. The standalone RNN model also performed well, with a high MAE of 121.54 and an R-squared of 0.949, indicating that it was quite robust for modeling stock price data. However, the CNN-LSTM and RNN-HMM models performed with relatively higher error rates, as indicated by the R-squared values of 0.8887 and 0.9459, respectively. This implies that combining traditional deep learning models with probabilistic approaches such as HMM may enhance prediction accuracy. Future work can explore integrating advanced optimization algorithms with these models to further refine predictive performance.

Keywords: Stock Price Prediction, Deep Learning, LSTM, CNN-LSTM, RNN, Hidden Markov Models, MAE, RMSE, R-squared.

THE DEVELOPMENT AND IMPLEMENTATION OF HONEY CLOUD FOR A SECURE CLOUD INFRASTRUCTURE

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ABSTRACT— This paper discusses how information sharing in the cloud is convenient and widely adopted, with all user information stored in the cloud. As with any website, we experience a high level of credential stuffing as well as the more traditional password guessing and brute force attacks. Blocking brute force attacks and unauthorized access to your system is done by preventing unauthorized login attempts and by locking users out after too many failed attempts. However, this type of method doesn't give you an idea of how the attacker is attempting to gain access, so it is hard for system administrators to reverse engineer the vector and stop it. Firewalls are more geared up towards detecting malicious activities and are designed to block them. We've implemented a honeypot, a decoy environment, in front of our real back-end server, and while legitimate users can continue to work as they always have, any suspicious activity is immediately directed to our honeypot environment. The attacker won't even realize that they've been redirected, as they will get the expected interface, and none of the system administrators will know of any actual malicious activity taking place. In the next release, we'll be implementing logging and monitoring on our honeypot in order to record all the login attempts and the pages and files that are being accessed in order to help us better understand our attackers and, therefore better block them.

Keywords—Brute force attacks, Honeypot Environment, Cloud Security, Credential Stuffing, Attack Monitoring and Logging

MODELING AND PROGNOSTICATION TRENDS IN SELF – HARM UTILIZING SOCIAL NETWORK DATA

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ABSTRACT: Self-harm is a heterogeneous term used to describe intentional self-injury and/or overdose using drugs or poisons, fatal or non-fatal. It is also linked with a variety of other wider social, economic and health care effects. The public health burden of self-harm is on the rise and is increasingly being recognized at a national level, as well as rising rates of self-harm which seem to be on the rise in developed countries just like they are on the rise in developing countries, and within both settings alongside modernization and rapid urbanization. Therefore, it is important for general policymakers and practitioners in the public health field to know about the prevalence of self-harm in a country along with timely information to do prevention of problems and to mitigate potential risk. The vast majority of recent self-harm studies rely on traditional statistical analysis of observational data to estimate the likelihood of self-harm in a population. A significant proportion of the countries do not have availability of statistical data, as mandated for the objective of prediction on a national level, or do not have them at the required granularity level or require an extensive time-lapse. FAST (free and large scale data approach to understanding and changing self-harm) is a new computational paradigm investigated this project, which exploits free social media data to harvest huge amounts of data to investigate its potential although they come from freely available resources. In this section, we present the Case Study of Thailand The model derived from the SIM method of FAST outperformed the traditional ARIA benchmark with an average improvement of 48% in MAPE for now casting and forecasting predictions using the framework proposed, as demonstrated in the experiments carried out in this case study. To the best of our knowledge, this is the first effort found in the literature to now cast and forecast trends of self-harm at a population level using patterns from aggregated social media intelligence.

Keywords*: Self- harm , Social media intelligence , Public health surveillance , Nowcasting and forecasting , Computational epidemiology ,Mental health prediction ,Machine learning.*

EVALUATION OF ONION SERVICE CLASSIFICATION PERFORMANCE UNDER ALTERED TOR TRAFFIC CONDITIONS

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ABSTRACT: Detection of the Onion Service Traffic in the Tor Network is considered one of the main challenges in Network Traffic Analysis and Cybersecurity Monitoring during the last few years. In fact, Tor (The Onion Router) is a system that makes it harder to figure out where website requests come from or where the sites the user visits are located. Obfuscation mechanisms such as extra encryption layers in Onion Services, and make traffic classification difficult and imperfect, to distinguish between Onion Services and normal Tor traffic. This work investigates the impact of different distortion techniques on the robustness of Onion Services traffic classification .In this work we evaluate the performance of three machine learning classifiers, namely Support Vector Machine, K-Nearest Neighbors and Random Forest, and investigate which subset of our dataset (i.e. standard datasets of the Tor traffic and modified datasets of WTFPAD of the traffic flow of the Onion Services) gives the best results for each classifier. Our goal is to obtain a concrete benchmark for Onion Service detection not only with standard datasets but also with modified datasets that take into account the type of modifications an attacker could cause in a compromised environment. We evaluate the robustness of the models we build and demonstrate that, although all classifiers achieved a detection rate of over 99% in almost all scenarios except for the visitors, the models are fragile and that the obfuscation techniques have a negative effect on the accuracy of the models (up to 15%).

Keywords: *Tor Network, Onion Services, Network Trafic Classification, Machine Learning, Trafic Obfuscation, WTFPAD*

AN INTELLIGENT MULTI-AGENT SYSTEM FOR AUTOMATED REASONING AND WORKFLOW OPTIMIZATION USING LARGE LANGUAGE MODELS

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ABSTRACT: Recent advances in artificial intelligence have accelerated the development of autonomous systems capable of reasoning, decision- making, and task execution. However, building scalable multi-agent AI systems often requires complex programming and infrastructure, limiting accessibility for rapid experimentation and deployment. This paper presents an Autonomous Multi-Agent AI System that leverages no-code workflow orchestration integrated with large language models to enable intelligent task understanding, planning, execution, and evaluation within a unified pipeline. The proposed system adopts a modular multi-agent architecture where each agent performs a distinct cognitive function, including task interpretation, action planning, intelligent execution, and output validation. A centralized orchestration layer coordinates agent interactions, ensuring structured data flow, scalability, and reliability. By combining visual workflow automation with AI-driven reasoning, the system enables rapid development of intelligent applications without extensive coding requirements. Experimental evaluation demonstrates that the multi-agent approach improves task clarity, execution efficiency, and output accuracy compared to single-agent models. The architecture supports flexible task handling across domains such as automation planning, knowledge generation, and intelligent decision workflows. This work highlights the potential of no-code AI orchestration as a practical solution for developing robust autonomous systems while reducing technical barriers. The proposed framework contributes a scalable, industry-aligned methodology for building intelligent multi-agent systems and offers a foundation for future advancements in adaptive automation and AI-driven workflow optimization.

Keywords: Autonomous Multi-Agent Systems, Large Language Models (LLMs), No-Code Workflow Orchestration, Multi-Agent Architecture, Intelligent Task Planning, Adaptive Automation

AN AI-ENABLED POA-DBFT BLOCKCHAIN FRAMEWORK FOR PREDICTIVE RISK MANAGEMENT AND END-TO-END INTEROPERABILITY IN NEXT-GENERATION HEALTHCARE SUPPLY CHAINS

Abstract: The growing complexity of global healthcare supply chains has worsened the risks of counterfeit pharmaceuticals, breakdowns of cold chains and supply disruptions in the logistics sector, which requires more intelligent and trustworthy digital infrastructures. Existing blockchain systems have problems delivering performance and predictive risk requirements against real-time performance, with a lack of scalability and analytical capabilities. This research shows an innovation to address these challenges in proposing an AI-enabled hybrid Proof-of-Authority and Delegated Byzantine Fault Tolerance (PoA-DBFT) based blockchain framework for the implementation of predictive risk management and end-to-end interoperability across heterogeneous healthcare systems. The methodology combines the use of multimodal IoT datasets, gradient boosted and deep learning-based anomaly detection, FHIR compliant interoperability services, as well as smart contract-based governance logic. Experimental evaluations with the Medical Supply Chain Integrity Dataset show that the proposed model provides 95.8% risk detection accuracy, 0.972 AUC-ROC, 1780 TPS throughput and block finality of 1.2 seconds, which improves the performance of five state-of-the-art baselines. The findings confirm that combining AI analytics and a hybrid consensus mechanism are powerful ways of increasing supply chain resilience, transparency and decision intelligence. The study concludes that the above unified architecture will provide a robust foundation for secure, scalable, and predictive digital health ecosystems that will pave the way for intelligent next-generation supply-chain infrastructures.

Keywords*:* Blockchain; Proof-of-Authority; Delegated Byzantine Fault Tolerance; Predictive Risk Management; Healthcare Supply Chain; AI-Driven Anomaly Detection; Interoperability; FHIR; Smart Contracts; Pharmaceutical Traceability.

DIABETIC RETINOPATHY

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Abstract: The eye is sometimes said to provide a window into the health of a person for it is only in the e Diabetic retinopathy (DR) is a serious eye disease originating from diabetes mellitus that one can actually see the exposed flesh of the subject without using invasive procedures. There are a number of diseases, particularly vascular disease that leave tell-tale markers in the retina. Microaneurysms (MAs) are early signs of DR, so the detection of this dark object is essential in an efficient screening program to meet clinical protocols. Retinal images provide considerable information on pathological changes caused by local optical disease which reveals diabetes, hypertension, arteriosclerosis, cardiovascular disease and stroke. Computer-aided analysis of retinal image plays a central role in diagnostic procedures. This project presents image processing techniques such as dark object detection to analyse the condition or enhance the input image in order to make it suitable for further processing and improve the visibility of vessels in colour fundus images. Then we can implement automate classification algorithm named as Transfer learning. The Transfer Learning architecture is designed to effectively extract features from retinal images, capturing intricate patterns associated with diabetic retinopathy. The model is trained using a combination of loss functions and optimization techniques to ensure convergence and generalization. Hyperparameter tuning is performed to optimize the model's performance on the validation set. The trained Transfer Learning is evaluated on separate test set, and its performance metrics, including accuracy, precision, recall, and F1 score, are reported.

EARLY DIAGNOSIS OF THE RISK OF SCHIZOPHRENIA USING HYBRID MACHINE LEARNING

Abstract: The critical issue in schizophrenia diagnosis is the ability to identify the disorder at an early stage to enhance clinical outcomes and decrease the cognitive and social impairments in the long term. Traditional diagnostic methods mainly rely on clinical judgments that are usually constraining accuracy and prompt intervention. In order to overcome these issues, this research proposes a hybrid machine learning architecture to the early detection of schizophrenia risk. The proposed method combines an autoeducator-based feature learning algorithm and an eXtreme Gradient Boosting (XG-Boost) classifier to make predictions better. The autoencoder is useful in capturing meaningful latent representations as it removes redundancy in features thus while XGBoost is used to classify robustly using ensemble learning. The proposed hybrid model is assessed and compared to the standalone XG-Boost and LightGBM classifiers in terms of conventional evaluation metrics, such as accuracy, precision, recall, and F1-score. The experimental findings indicate that the Hybrid Autoencoder-XGBoost model has a better performance being accurate at 97.69, which is higher compared to the comparative models. These results suggest that deep feature representation with ensemble learning provides an effective and consistent solution to early schizophrenia risk detection and this feature could be utilized in the clinical decision support systems.

IMPROVED PREDICTING E-COMMERCE SALES FROM AMAZON REVIEWS USING SUPPORT VECTOR MACHINE AND LSTM NETWORKS

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Abstract: The rapid growth of e-commerce platforms has generated massive volumes of user-generated content in the form of online product reviews, offering valuable insights into customer sentiment and purchasing behavior. Effectively leveraging this unstructured and temporally evolving data for predictive modeling remains a significant challenge. Accurate sales and purchase behavior prediction is essential for inventory planning, demand forecasting, and strategic decision-making in competitive e-commerce environments. This study presents a comprehensive comparative analysis of Support Vector Machine (SVM) and Long Short-Term Memory (LSTM) networks for sentiment-aware predictive modeling in e-commerce. Using large-scale Amazon product review data comprising textual reviews, ratings, and timestamps, both classical machine learning and deep learning approaches are implemented and evaluated. The proposed methodology integrates text preprocessing, sentiment extraction, feature engineering, and temporal aggregation to enhance predictive accuracy. Experimental results demonstrate that SVM provides a computationally efficient baseline with competitive performance in sentiment-based prediction tasks, while LSTM significantly outperforms SVM in capturing sequential and temporal dependencies inherent in review data. The findings confirm that incorporating sentiment and temporal dynamics substantially improves sales forecasting accuracy. This research offers practical guidance for selecting appropriate predictive models based on performance, scalability, and computational constraints, contributing to the advancement of intelligent decision-support systems in e-commerce platforms.

Keywords: E-Commerce Analytics, Sales Forecasting, Sentiment Analysis, Support Vector Machine, Long Short-Term Memory, Predictive Modeling, Online Product Reviews, Machine Learning and Deep Learning.

BLOCKCHAIN-ENABLED SECURE EMR SHARING WITH ECC-BASED ROLE-CENTRIC ACCESS CONTROL

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Abstract: Companies can utilize Cloud-based Storage methods to effectively and efficiently store and manage their Data within the cloud while having fast and easy access to their Data with little expense associated with managing that Data. When taking advantage of cloud computing and cloud storage, companies will be challenged by the need for security and privacy of sensitive Data. The goal of this Project is to provide a secure method for electronically sharing Medical Records via the Cloud while protecting the Confidentiality of the Data and ensuring that all users have Privacy concerning their personal health information. The Secure Medical Record Sharing Platform utilizes a hybrid model to manage User access to Medical Records through the use of Role-Based Access Control and Decentralized Blockchain Architecture so that only authorized Users have access to Encrypted Medical Record Data. Also utilized in the Secure Medical Record Sharing Platform is Elliptic Curve Cryptography (ECC) for Lightweight, Secure Encryption of both User and Group Keys which allows for efficient key-distribution and key-management. The Hybrid Nature of the Secure Medical Record Sharing Platform includes the storage of Sensitive Hierarchical Roles and the mapping of those Roles and Users on a Private Cloud, while also storing the Encrypted Medical Record Data together with the parameters that allow Public Access to the Encrypted Medical Record Data on a Public Cloud. With this solution, once a user has been removed from an associated role, their access will be securely revoked and a new group key will be created and enforced automatically, thus preventing unauthorized access without having to re-encrypt existing electronic medical record (EMR) data. By combining blockchain technology, which has an immutable characteristic associated with it, with ECC encryption and role-based access control, this project will provide a secure, efficient, and flexible way to share EMRs across the Cloud while safeguarding the data and personal privacy of both users and organisations.

Keywords: Access Control, Block chain, Cloud Computing, ECC Encryption, EMR, Hybrid Cloud, User Revocation

A HYBRID NLP AND MACHINE LEARNING FRAMEWORK FOR BLOOM'S TAXONOMY BASED COGNITIVE QUESTION CLASSIFICATION

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Abstract: Bloom's Taxonomy is a crucial pedagogical framework for organizing learning objectives, guaranteeing that learning activities advance from the acquisition of fundamental knowledge to higher-order cognitive abilities. Remember (K1), Understand (K2), Analyze (K4), Evaluate (K5), and Create (K6) are the first six hierarchical levels into which the taxonomy arranges cognitive processes. For assessment and instructional design to be effective, these cognitive levels must be accurately identified. The majority of automated Bloom's Taxonomy classification systems currently in use, however, are limited in their applicability in real-world interactive environments where informal and conversational queries are common because they assume that all input queries are academically structured. Furthermore, depending only on keyword presence is insufficient because similar keywords may appear on different cognitive levels without accurately reflecting the question's underlying semantic intent. The main goal of this study is to categorize a given question into the relevant Bloom's cognitive level (K1–K6) and, in cases where it does not correspond to any academic cognitive level, to place it in a separate Non-Bloom category. In order to do this, a hybrid framework for natural language processing is put forth that makes use of supervised machine learning and TF-IDF based feature extraction to identify semantic patterns that go beyond simple keywords. The main model used is a multi class logistic regression classifier, with Support Vector Machine and Naïve Bayes classifiers added for comparing performance.

Keywords: Bloom's Taxonomy, Cognitive Level Classification, Natural Language Processing, Machine Learning, Logistic Regression, Intelligent Tutoring Systems

EXPLAINABLE MULTILINGUAL FAKE NEWS DETECTION USING TRANSFORMER ARCHITECTURE

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Abstract: Detecting fake news poses a significant challenge in the field of Natural Language Processing (NLP). The rapid expansion of social networking platforms has resulted in an unprecedented volume of information while simultaneously accelerating the spread of misinformation, thereby increasing its societal impact and in some cases, posing risks to public safety. The rapid dissemination of multilingual misinformation across digital platforms is therefore recognized as a critical challenge for automated content verification systems. In this research, a transformer-based framework for multilingual fake news detection is proposed using a Bidirectional Encoder Representations from Transformers (BERT) architecture. Specifically, the bert-base-multilingual-cased model is employed to generate contextual semantic representations for English and Tamil news articles without requiring explicit translation, thereby reducing computational overhead while preserving linguistic nuances. A comprehensive preprocessing pipeline is designed to normalize textual inputs and enhance token representation for downstream classification. The model is trained using the AdamW optimizer with cross-entropy loss and is evaluated on a curated dataset comprising 5,226 labeled news articles. A classification accuracy of 93.4% is achieved, indicating strong predictive capability. To improve interpretability, SHAP-based explainable artificial intelligence techniques are integrated to provide token-level contribution insights. The robustness and generalization ability of the proposed approach are further confirmed through statistical validation. The proposed system demonstrates scalability, transparency, and effectiveness for real-time misinformation management in multilingual online environments.

Keywords: Fake News Detection, Multilingual NLP, BERT, Explainable AI, Computational Intelligence.

IMPACT OF INPUT DATA ARRANGEMENT ON THE PRACTICAL PERFORMANCE OF SORTING ALGORITHMS: A COMPARATIVE STUDY

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Abstract: Sorting algorithms are a fundamental component of computer science and are traditionally evaluated using asymptotic time complexity, which primarily considers input size while assuming generic input distributions. However, in practical scenarios, real-world data often exhibits specific structural characteristics such as partial ordering, duplication, or adversarial arrangements that are not adequately captured by theoretical analysis alone. This paper presents a comprehensive experimental study on the impact of input data arrangement on the practical performance of sorting algorithms, ranging from elementary algorithms such as Bubble Sort, Selection Sort, and Insertion Sort to more advanced algorithms including Merge Sort, Quick Sort, and Heap Sort. All algorithms are implemented in C++ to ensure minimal runtime overhead and accurate performance measurement. Multiple input datasets are systematically generated to represent diverse data arrangements, including random, sorted, reverse-sorted, nearly sorted, duplicate heavy, and patterned inputs. Performance is evaluated using metrics such as execution time, number of comparisons, and number of element movements. The results demonstrate that algorithms with identical asymptotic time complexity can exhibit significantly different performance under varying input arrangements. In particular, simple algorithms like Insertion Sort outperform asymptotically faster algorithms on nearly sorted datasets, while divide-and-conquer algorithms show sensitivity to specific input patterns. This study highlights the limitations of relying solely on theoretical time complexity and emphasizes the importance of input data characteristics in algorithm selection. The findings provide practical guidelines for choosing appropriate sorting algorithms based on real-world data properties rather than theoretical bounds alone.

Keywords: Sorting Algorithms, Insertion Sort, Bubble Sort, Selection Sort, Merge Sort, Quick Sort, Heap Sort, Time Complexity, Asymptotic Notations, Input Data Characteristics, Execution Speed.

DETECTING DIGITAL FATIGUE THROUGH BEHAVIORAL DATA ANALYTICS USING MACHINE LEARNING TECHNIQUES

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Abstract: The widespread integration of digital devices into daily routines has been associated with increasing cases of digital fatigue, which is characterized by mental exhaustion, diminished focus, and reduced productivity. Despite its significant impact on well-being and performance, digital fatigue has been only partially examined through data-driven approaches. In this research, behavioral and psychological data were analyzed to detect digital fatigue using machine learning techniques. A dataset containing measures such as anxiety score, depression score, stress level, happiness score, focus score, productivity score, and digital dependence score was employed to identify patterns linked to fatigue. Classification of fatigue levels was performed through decision trees and random for-ests, enabling quantifiable insights into how digital device usage influences mental state, concen-tration, and productivity. By establishing measurable indicators of digital fatigue, opportunities for early detection and personalized interventions were created. Potential applications were envisioned in workplace environments, educational contexts, and personal health management. The findings demonstrate that behavioral and psychological data, when combined with machine learning, can be effectively utilized to understand and mitigate digital fatigue. Through this approach, healthier digital habits may be encouraged, and strategies for improved well-being and performance can be supported.

Keywords: Digital fatigue detection, Decision Trees, Support Vector Machines (SVM), Random Forests, Screen time analysis.

COMPARATIVE ANALYSIS OF FULL FRAME PROCESSING AND KEY FRAME EXTRACTION FOR EFFICIENT DEEP LEARNING–BASED ANOMALY DETECTION IN SURVEILLANCE VIDEOS

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Abstract: Surveillance video anomaly detection usually relies on full-frame processing, which causes a lot of unnecessary computation, increases memory use, and leads to high detection delays due to many non-informative frames.. This study compares Full Frame Processing (FFP) and Key Frame Extraction (KFE) for efficient anomaly detection in surveillance videos. The proposed framework examines both approaches using the same deep learning architecture with UCF-Crime Dataset videos.It extracts spatial features using EfficientNetB0 and temporal modeling is performed through an LSTM network. In the Full Frame Processing technique, all preprocessed frames are used for extracting features and sequence modeling. In contrast, the Key Frame Extraction method lowers redundancy by selecting only informative frames earlier to deep feature computation. Both approaches are evaluated using precision, recall, F1-score, AUC, total processing time, and redundancy percentage. Experimental results exhibit that Key Frame Extraction significantly cuts down the number of processed frames and computational redundancy while retaining or improving anomaly detection performance. The KFE-based framework demonstrates reduced total processing time and lower redundancy percentage compared to full-frame processing, while preserving comparable precision, recall, F1-score, accuracy and AUC performance; additionally, redundancy analysis validates that a major proportion of non-informative frames can be eradicated without diminishing detection accuracy. The findings reveal that Key Frame Extraction (KFE) is not uniquely a redundancy reduction technique but a computational optimization strategy that enhances processing efficiency while safeguarding detection performance. This study confirms that KFE offers a practical and flexible framework for efficient deep learning–based anomaly detection, notably in resource-constrained and time-sensitive surveillance environments.

EDUBOT: A SMART AI VIRTUAL ASSISTANT FOR PERSONALIZED EDUCATION

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Abstract: Educational institutions are increasingly adopting digital platforms to enhance communication and accessibility for students, staff, and visitors. However, college websites oftenlack interactive support systems, making it difficult for users to quickly obtain information relatedtoadmissions, courses, events, academic schedules, and institutional services. These limitations canlead to delays in information access and increased workload for administrative support. To overcome these challenges, this paper proposes EduBot, an AI-powered chatbot integrated intoacollege website to provide instant and reliable assistance to users. EduBot is designed using Computational Intelligence and Natural Language Processing (NLP) techniques to understandqueries and deliver context-aware responses in real time. In addition, the systemincorporates Retrieval-Augmented Generation (RAG) technology, enabling the chatbot to retrieve relevant information from college databases, FAQs, and official documents before generating accurate andcontext-specific responses. This improves reliability, reduces hallucinated outputs, and enhances user trust. The proposed architecture includes secure access modules, a centralized knowledgebase, and an intelligent intent recognition engine for accurate query handling. EduBot improves user engagement, reduces response time for routine enquiries, and enhances the overall digital experience of the college website. The implementation demonstrates that AI-driven conversational systems can significantly contribute to smart campus development by strengthening communication, minimizing administrative burden, and promoting efficient information delivery. EduBot serves as a scalable and user-friendly solution for modern educational institutions.

Keywords: EduBot, AI Chatbot, College Website, Computational Intelligence, NLP, Retrieval-Augmented Generation (RAG), Smart Campus.

SKIN CANCER DETECTION USING EFFICIENT

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Abstract: The most increasing health issue is Skin Cancer so, the skin cancer should detected and accurate earlier for the effective treatment. This study is proposes an Automated skin Detection using the Efficient Net models that ranges from B0-B4 it classify the dermoscopic images. This model was trained and evaluated in the HAM10000 dataset with the preprocessing and transfer the learning applied to enhances the features of extraction and improvements classification perfomance. The experimental evaluation shows that advanced Efficient Net variants achieve higher accuracy and reliability in distinguishing between different types of skin cancers for example benign and malignant lesions. The proposed approach highlights the potential of deep learning in supporting dermatologists with faster consistent and more precise diagnosis contributing to improved healthcare outcomes.

Keywords: Skin Cancer Detection, Efficient Net, Deep learning, Image classification, Dermoscopic images, Early Detection.

SMARTPANTRY AI: TRANSFORMING HOME KITCHENS THROUGH INTELLIGENT AUTOMATION

Abstract: The rapid advancement of artificial intelligence in smart home ecosystems has opened new opportunities for optimizing domestic resource management, particularly in the domain of kitchen inventory control and meal planning. However, modern households continue to face persistent challenges such as food waste, inefficient grocery management, manual data entry, and lack of personalized meal recommendations. These issues contribute not only to economic loss but also to environmental concerns due to unnecessary food disposal. This work presents a Smart Kitchen Inventory Management System, a web-based application developed using the Django framework and integrated with Google's Gemini AI to address these challenges through automation and intelligent deci-sion support. The system focuses on real-time inventory tracking, AI-driven recipe generation, and automated grocery bill digitization. A Model–View– Template (MVT) architecture with an SQLite backend ensures structured data management and scalability. The proposed methodology integrates computer vision techniques for bill scanning, natural language processing for recipe generation via the Gemini API, and rule-based logic for expiry date monitoring and notification. Additional modules support nutritional tracking and dynamic shopping list creation. The system was designed to minimize manual intervention while maximizing usability across devices through a responsive interface. By leveraging artificial intelligence and automation, the proposed solution enhances decision-making in meal planning, reduces food waste, and streamlines household grocery management. The findings demonstrate that integrating AI-driven recommendation systems with real-time inventory monitoring can significantly improve operational efficiency in home kitchens. The framework also provides a scalable foundation for future enhancements, including predictive consumption modeling and integration with IoT-enabled appliances.

Keywords: Smart Kitchen, Inventory Management System, Artificial Intelligence, Gemini API, Django Framework, Computer Vision, Recipe Generation, Food Waste Reduction, Smart Home Automation.

LEARN2INVEST: AN INTELLIGENT FA–TA BASED STOCK MARKET EDUCATION AND PAPER TRADING SYSTEM

Abstract: The growing participation of retail investors in financial markets has intensified the need for accessible and practical stock market education systems. While numerous platforms offer either theoretical instruction or standalone trading tools, beginners often struggle to understand how investment decisions are formulated and evaluated in real-world scenarios. This disconnect between conceptual learning and practical application results in limited decision-making confidence and increased risk exposure. This work presents Stock Learn, an integrated stock market education and paper trading platform designed to bridge the gap between theory and practice. The platform focuses on combining Fundamental Analysis (FA) and Technical Analysis (TA) within a unified learning ecosystem. Structured educational modules introduce core investment concepts, including financial statement analysis, valuation metrics, price trends, and technical indicators. These learning components are directly linked to an interactive paper trading environment that enables users to execute simulated trades using virtual capital in a risk-free setting. The proposed methodology integrates analytical models that generate insights based on FA metrics (such as earnings, revenue growth, and valuation ratios) and TA indicators (including moving averages and trend signals). A feedback mechanism compares system-generated insights with user decisions and subsequent simulated outcomes, providing guided evaluation and performance tracking. This iterative learning loop enhances conceptual clarity and reinforces practical understanding. The results suggest that integrating educational content, analytical insights, and simulated trading within a single platform significantly improves experiential learning and decision-making confidence. By offering a structured, risk-free, and feedback-driven environment, Stock Learn demonstrates the potential of technology-enabled financial education systems to empower beginner investors and promote informed participation in financial markets.

Keywords: Stock Market Education, Fundamental Analysis, Technical Analysis, Paper Trading, Financial Technology, Investment Learning, Decision Support Systems, Experiential Learning.

MATHEMATICAL MODELING OF BIO-INSPIRED SWARM OPTIMIZATION ROUTING PROTOCOL FOR OPTIMAL PERFORMANCE IN MANET

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Abstract: Mobile ad hoc networks (MANETs) have been improved by significant technological developments in the mobile communications industry to serve a variety of fields, including army activities, disaster relief, urban environments, and crisis response. MANET's self-organizing mobile nodes collaborate to form a dynamic network architecture for making connections. Wireless networks are typically used in adverse circumstances. Energy consumption is mandatory as it is impractical to change batteries in such circumstances. This study suggests a mathematical framework for an enhanced routing protocol based on particle swarm optimization that minimizes energy consumption and delays. Here, the selection procedure is carried out using the GAR- Gradient Assisted Routing Algorithm, EEMRA- Energy Efficient Multipath Routing Algorithm, and DPSORP- Deft Particle Swarm Optimization Routing Protocol Algorithm, while data transmission is carried out with multiple path selection. The common network performance metrics are evaluated using the NS3 simulator. Using the simulated setting and the routing protocol's parameters—such as load, packet-based delivery, and average end-to-end delay—we evaluated the regression model. The mathematical model based on sum of least squares & Gauss-Seidel is proposed to show that the enhanced version of particle swarm algorithm outperforms in minimizing end-end delays and consumption of energy.

AI-POWERED CYBER THREAT DETECTION AND PREVENTION

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Abstract: AI-Powered Cyber Threat Detection and Prevention is an advanced cybersecurity framework that leverages Artificial Intelligence (AI) and Machine Learning (ML) techniques to identify, analyze, and mitigate cyber threats in real time. With the rapid expansion of digital technologies, cloud computing, and interconnected systems, organizations face increasingly sophisticated cyberattacks such as ransomware, phishing, insider threats, and zero-day exploits. Traditional rule-based security systems often fail to detect evolving threats due to their static nature. AI-driven solutions overcome these limitations by continuously learning from large volumes of network traffic, system logs, and user behavior data to recognize unusual patterns and potential risks. The methodology typically involves data collection from multiple sources, preprocessing and feature extraction, model training using supervised or unsupervised learning algorithms, anomaly detection, and automated incident response. Advanced techniques such as deep learning, behavioral analytics, and predictive modeling enhance detection accuracy and reduce false positives. Once a threat is identified, automated response mechanisms can isolate affected systems, block malicious activities, and generate real-time alerts, minimizing damage and downtime. Future enhancements include the integration of explainable AI (XAI) for improved transparency, adaptive self-learning models for faster threat detection, and collaborative global threat intelligence sharing. The future scope extends to cloud security, Internet of Things (IoT) protection, autonomous Security Operations Centers (SOC), and critical infrastructure defense. Overall, AI-powered cybersecurity solutions provide scalable, proactive, and intelligent protection against modern cyber threats.

Keywords: Artificial Intelligence (AI), Machine Learning (ML), Cyber Threat Detection, Anomaly Detection, Network Security

CLINICAL-GRADE BLIND ECG SIGNAL RESTORATION: A DEEP LEARNING APPROACH

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Abstract : ECG records often suffer from various types of seriousness, harshness, and durations, and this makes diagnosis by machines or medical doctors more difficult and undependable. Innumerable studies have put forward ECG noise reduction, cleaning, filtering, and smoothing. However, they naturally fail to restore the actual ECG wave corrupted with such artifacts because of their simple and artless noise model. In this experimental study, we propose a paperback approach for blind ECG restoration using a cycle-consistent reproductive hostile network (Cycle-GANs), where the quality of the signal can be upgraded to a clinical-level ECG notwithstanding the type and reliability of the artifacts corrupting the signal.METHODS**:** To further boost the restoration execution, we present 1D operational Cycle-GANs with a generative neuron model. RESULTS: The proposed approach has been judged extensively using one of the largest standard ECG datasets from the China Physiological Signal Challenge (CPSE-2020), with more than 1 million data samples for ECG restoration. Besides the quantitative and qualitative judgment, a group of doctors specialized in cardiology performed a medical evaluation to confirm the quality and operability of the restored ECG, especially for a precise heart block. SGNIFICANCE**:** As an experimental study in ECG restoration, the corrupted ECG signals can be restored to an objectified-level quality

Keywords: ECG restoration, Cycle-GAN, 1D operational networks, Deep learning, Biomedical signal processing, Clinical-grade ECG, Noise removal.

AUTOMATED RESUME RANKING AND ENHANCING RECRUITMENT EFFICIENCY USING ADVANCED NLP AND SENTENCE-BERT

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ABSTRACT: The digitalization of the recruitment systems has greatly accelerated the number of resumes that organizations receive, which makes the manual methods of screening a resume quite inefficient, time-consuming and prone to subjective bias. The current Applicant Tracking System (ATS) use mostly utilizes the technique based on key-searching and rule-based approach to filtering through the applications and retrieving the results; such systems are unlikely to retrieve the semantic background and essence of skills, experience, and work requirements in candidates. Consequently, there is a possibility of a highly qualified candidate being left out on the basis of lexical differences and not necessarily on the basis of suitability. To address these drawbacks, this paper introduces a framework of automated resume ranking and job recommendation by using progressive Natural Language Processing (NLP) and transformer-based deep learning methods. The suggested system applies Sentence-BERT (SBERT), a state-of-the-art transformer, in generating dense semantic embedding of resumes and real job descriptions to semantically compress them, allowing semantic similarity to be computed upon them. The system accepts the resumes in popular PDF and word document format and does automated extraction and preprocessing of the text. The job descriptions obtained via the actual recruitment sites are handled in parallel to form an empty semantic representation space. The cosine similarity is used to calculate relevance scores between resume embeddings and job description embeddings to enable the system to rank job roles in semantic relevance. The proposed framework, in contrast to traditional classification-based methods, implemented ranking-based analysis methodology, which is more in line with the actual recruitment processes, which do not focus on binary decisions but shortlisting the candidates in a ranked list. Through a large-scale experimental study, it has been proven that the suggested SBERT-based model performs much better than the conventional machine learning models and the LSTM-based deep learning architectures. The system has a Top-5 job recommendation accuracy of over 95 percent and a Top-10 accuracy of almost 99 percent, which underscores its efficiency in intelligent shortlisting of candidates. The proposed framework will improve the efficiency, minimize the manual work, human bias, and decision consistency through automation of resume screening and ranking.

Keywords: Resume Ranking, Recruitment Automation, Sentence-BERT, Semantic Similarity, Natural Language Processing, Job Recommendation System, Transformer-based Deep Learning.

RETINA BLOOD VESSEL SEGMENTATION USING DEEP LEARNING

ABSTRACT: Image analysis of the retina has a significant impact on the prompt identification of ocular diseases that can ultimately result in an individual losing their vision if the disease is not detected as soon as possible. Disease of the retina from diabetes is one of the leading causes of damage to the retina, where the vascular system of the retina is predominantly affected. The process to diagnose these diseases is long and requires extensive expertise from the practitioner. Recent advances in the field of image processing and artificial intelligence (AI) have enabled automated detection of retinal images using AI with a greater level of accuracy and efficiency than traditional manual techniques. In fact, recent studies using deep learning approaches are providing superior capabilities for the detection and segmentation of retinal blood vessels in comparison to manual techniques. These methods significantly enhance the ability to detect abnormalities within the retinal vascular network. This paper discusses the deep learning techniques that are currently available for retinal image analysis, specifically the techniques for segmentation of the retinal blood vessels. The paper reviews a number of published studies using different techniques for segmentation of retinal blood vessels and discusses their advantages and disadvantages. Based on this review of the current state of research, the paper identifies challenges that exist and offers suggestions for how retinal image analysis techniques can be improved in the future.

VISION-BASED AUTOMATED ATTENDANCE SYSTEM USING HAAR CASCADE ALGORITHM

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Abstract: Maintaining accurate student attendance records in educational institutions has become increasingly challenging, particularly with the rapid expansion of virtual and hybrid learning environments. Traditional attendance systems that rely on manual recording are time-consuming, inefficient, and highly susceptible to human error. Moreover, such systems are vulnerable to fraudulent practices, including proxy attendance, which compromises the reliability and integrity of attendance data. These limitations highlight the need for an automated and intelligent attendance monitoring system that ensures accuracy, efficiency, and transparency. Facial recognition technology has emerged as a reliable biometric identification method due to the uniqueness and difficulty of replicating human facial features. This paper proposes a real-time automated attendance system that utilizes face detection and recognition techniques to accurately identify students. The system captures live video input through a camera and processes the frames to detect and recognize faces. Detected faces are compared with stored facial data in a database, and attendance is automatically recorded when a successful match is identified. The proposed system employs the Haar Cascade algorithm, a machine learning–based object detection technique widely used for real-time face detection. The algorithm is trained using a large dataset of positive (face) and negative (non-face) images, enabling efficient and accurate detection of frontal faces. The system is implemented using OpenCV, an open-source computer vision library that provides robust tools for image processing and facial recognition applications.

Keywords: Facial Recognition, Automated Attendance System, Face Detection, Haar Cascade Algorithm, Computer Vision.

BEAMFORMING-INDUCED CSI VARIATIONS AND REAL-TIME SECURITY FEASIBILITY IN 6G THZ V2X NETWORKS

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Abstract—Terahertz (THz) vehicle-to-everything (V2X) links are a key 6G enabler due to abundant spectrum, but their highly directional beamforming reshapes physical-layer channel state information (CSI) in a manner that can be exploited for security-oriented situational awareness. This paper presents a compact, self-contained 300 GHz V2X simulation to quantify beamforming-induced CSI variations and to evaluate whether feature-based physical-layer analytics can meet strict 6G latency constraints. A balanced dataset of 1,000 samples is generated (500 legitimate, 500 alternative spatial observations) using a THz path-loss model with molecular absorption and a Gaussian beam pattern. Feature-importance analysis reveals that beamforming gain (0.3983) and angle misalignment (0.3211) dominate the CSI variation signature, followed by SNR (0.0919), RSS (0.0877), and path loss (0.0421). Computational measurements demonstrate microsecond-scale per-sample latency: 25.57 µs (Random Forest), 7.01 µs (SVM), and 1.09 µs (DNN), corresponding to throughputs of 39.1k, 142.8k, and 913.3k samples/s. The results demonstrate that beamforming-centric CSI signatures are both physically interpretable and computationally feasible for real-time security pipelines in 6G THz V2X systems. Index Terms—Beamforming, Channel State Information (CSI), Physical-layer security, Real-time feasibility, Latency analysis.

VISTAS: REAL-TIME DEEPFAKE DETECTION USING MOBILENETV2 FOR AUTOMATED FACIAL FORENSICS

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Abstract: The rapid rise of hyper-realistic synthetic media, commonly known as Deepfakes, has posed significant challenges to the integrity of digital content. Traditional verification methods relying on human visual inspection are increasingly inadequate, as Generative Adversarial Networks (GANs) can produce forgeries that are nearly indistinguishable from authentic images. Manual detection is time-consuming, error-prone, and insufficient to curb misinformation, identity theft, and cyber fraud. To address these issues, an automated and intelligent forensic system is required to ensure accurate and efficient media authentication. This paper presents VISTAS (Visual Integrity Security & Tracking AI System), a real-time deepfake detection framework that leverages deep learning techniques for facial forensic analysis. The system captures image inputs via a secure web interface, extracts subtle feature patterns, and compares them with trained neural network weights to classify images as authentic or manipulated. VISTAS uses the MobileNetV2 architecture, a high-efficiency Convolutional Neural Network (CNN) optimized for real-time performance on resourceconstrained devices. The model is trained on a large dataset of authentic and synthetic facial images, enabling it to detect microscopic artifacts, hidden noise distributions, and structural inconsistencies left by AI-generated content. Implemented with TensorFlow and OpenCV, the system provides a scalable and user-friendly solution for media organizations and cybersecurity agencies. By automating deepfake detection, VISTAS enhances digital trust, supports content verification, and mitigates the risks associated with AI-generated media in the modern digital landscape.

Keywords: Deepfake Detection, Facial Forensics, Artificial Intelligence (AI), Convolutional Neural Networks (CNN), MobileNetV2

LEARNING RESOURCE MANAGEMENT SYSTEM WITH STUDY TRACKER USING FULL-STACK WEB TECHNOLOGIES

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Abstract: In the digital era, students increasingly rely on online platforms such as YouTube, educational websites, and cloud-based resources for learning. However, the absence of a centralized system for managing these scattered materials makes it difficult to organize resources effectively and monitor academic progress. To address these challenges, this paper proposes a Learning Resource Management System with Study Tracker—a comprehensive web-based platform that enables students to efficiently manage educational content and track their study activities. The system is implemented as a full-stack web application using ReactJS for the frontend, NodeJS and ExpressJS for the back-end, and MongoDB as a cloud-based database. A modern client-server architecture with RESTful APIs ensures seamless communication between the frontend and backend. The platform provides subject-based course management, downloadable study materials, real-time study hour tracking, and robust search and filter capabilities for efficient resource retrieval. Key features include a centralized dashboard for course management, organized storage of downloadable notes, intuitive navigation, and study progress monitoring. By integrating these functionalities into a single platform, the system reduces the time and effort required to manage learning resources, promotes disciplined study habits, and enhances overall academic productivity. This project demonstrates the practical application of modern web development technologies and offers a scalable, extensible solution for students and educational institutions. Future improvements include user authentication, AI-based content recommendations, advanced analytics for performance insights, and mobile application integration to further enhance accessibility and usability.

Keywords: Learning Resource Management, Study Tracker, Educational Dashboard, Full-Stack Web Development, ReactJS, NodeJS, MongoDB, RESTful API.

AI-POWERED JOB RECOMMENDATION AND SKILL GAP ANALYZER USING NLP AND MACHINE LEARNING

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Abstract: In today's competitive job market, candidates often apply for positions without fully understanding whether their qualifications and skills align with employer expectations. This mismatch can lead to repeated rejections and uncertainty regarding career direction. To address this challenge, the AI-Powered Job Recommendation and Skill Gap Analyzer is a web-based system designed to provide personalized career guidance by leveraging Artificial Intelligence (AI) and Natural Language Processing (NLP) techniques. The system allows users to upload resumes in PDF or DOCX formats, extracting textual information using libraries such as PyPDF2 and python-docx. NLP techniques, implemented through SpaCy, identify technical skills, educational qualifications, work experience, and relevant keywords. Real-time job listings are fetched from job portals via APIs such as Adzuna, and a matching algorithm compares the user's skills with job descriptions to calculate similarity scores, recommending the most suitable job roles. In addition, the system performs a skill gap analysis by identifying missing or underdeveloped skills required for specific positions. Users receive actionable suggestions to enhance their qualifications and improve employment prospects. The platform is developed using Python and Flask for backend processing, with HTML and CSS for a responsive and user-friendly interface, allowing candidates to upload resumes and receive structured feedback efficiently. By combining AI-driven job matching and skill gap analysis, the system reduces uncertainty in career planning, streamlines the job search process, and empowers users with data-driven insights. This project demonstrates how intelligent systems can support smarter career development strategies and enhance employment outcomes in the modern workforce.

Keywords: Job Recommendation System, Skill Gap Analysis, Artificial Intelligence (AI), Natural Language Processing (NLP), Resume Parsing.

AN AUTHORITY-FIRST HYBRID ACADEMIC CHATBOT FOR RELIABLE INSTITUTIONAL QUERY HANDLING AND ADMISSION WORKFLOW AUTOMATION

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Abstract: Handling a large volume of admission-related queries has become a significant operational challenge for administrative departments in higher education institutions. Existing chatbot systems predominantly rely on generative AI-based techniques that may provide responses without validating institutional data sources, thereby affecting the reliability of shared information. To address this limitation, this project proposes an Authority-First Hybrid Academic Chatbot for institutional query handling and admission workflow support. The system primarily retrieves information from institutionally verified data repositories to ensure accuracy and consistency in communication. In scenarios where relevant information is temporarily unavailable, a Natural Language Understanding (NLU)-based fallback mechanism is utilized to provide uninterrupted user assistance. The proposed chat-bot supports essential admission-related processes including eligibility verification, OTP-based user authentication, and application status tracking through rule-based logic to maintain transparency in workflow automation. Real-time communication between system components is implemented using WebSocket technology to improve response time and interaction efficiency. Experimental evaluation with performance analysis in a simulated institutional enquiry environment indicates improved response consistency and reduced manual administrative workload. The system maintains a clear separation between conversational assistance and institutional decision-making processes to prevent automated influence on admission outcomes.

Keywords: Academic Chatbot, Admission Automation, Institutional Data Retrieval, Natural Language Understanding, WebSocket Communication, Workflow Automation.

EYESIGHT AI: A REVIEW OF DEEP LEARNING BASED IMAGE CLASSIFICATION METHODS FOR RETINAL DISEASE DETECTION USING FUNDUS IMAGES

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Abstract: Retinal diseases are a major cause of vision impairment worldwide, and early diagnosis is essential for effective treatment and prevention of vision loss. With the rapid advancement of deep learning, automated retinal image analysis using fundus and optical coherence tomography (OCT) images has become an important research area. In recent years, many researchers have proposed deep learning based image classification models for retinal disease detection using convolutional neural networks, transfer learning frameworks, and ensemble learning strategies. However, differences in model architectures, preprocessing pipelines, datasets, and evaluation methods lead to varying performance and practical limitations. This review paper presents a structured survey and comparative analysis of recent deep learning approaches for automated retinal disease classification reported in the last few years. The study examines existing methods with respect to network architectures, transfer learning backbones, data preprocessing techniques, training strategies, and performance metrics. Reported advantages and limitations of different approaches are analyzed to identify current research trends and gaps. Based on insights from the reviewed literature, an implementation-oriented framework, referred to as EyeSight AI, is outlined to demonstrate how transfer learning and ensemble-based prediction techniques can be integrated into a practical retinal screening support system. This review aims to provide a consolidated understanding of current computational intelligence techniques and highlight future directions in automated retinal diagnostics.

Keywords: Deep Learning, Retinal Disease Detection, CNN, Transfer Learning, Fundus Image Analysis.

REAL-TIME USER AND ENTITY BEHAVIOR ANALYTICS (UEBA) FOR INSIDER THREAT DETECTION

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Abstract: Enterprises today face serious risks from insider employees whose malicious activities can cause heavy financial and reputational damage. Traditional insider threat detection methods mostly highlight abnormal users or abnormal time periods (like a day or a week). However, in practice, a single user may generate thousands of events in just one day, making it costly and time-consuming to manually verify suspicious cases. Furthermore, most existing studies are post-hoc, meaning they analyze logs only after the incident, which fails to prevent losses in real time. To address recent research like a paper at the 2024 LAN conference proposed a fine-grained approach. Activity-level framework for real-time insider threat detection using graph neural networks. Their learning model learns both the structure of a language and the meanings of the symbols within it. temporal order of activities and the relationships across sequences In order to tackle data imbalance, a hybrid loss function should also be used. Nine state-of-the-art approaches have been surpassed by the LAN in terms of results obtained. The use of the CLEVR dataset improved the AUC score by 5.8% and the CERT r4.2 and r5.2 datasets by almost 8% and 7.1% respectively over a baseline model. 10%. Building on this, our project proposes a hybrid GraphSAGE+ GAT model for real-time User and Entity Behavior Analytics Our system, as opposed to other network systems, concentrates on scalability in terms of the number of users and network size. interpretability, and reduction of false positives. By combining GraphSAGE's efficient neighbor sampling with GAT's attention mechanism, we design a framework that not only detects insider threats in real time but also explains why a user was flagged, making it more practical for Security Operation Centers (SOCs)

Keywords: Graph Neural Networks, Hybrid GNN Architecture, GraphSAGE, Graph Attention Network, Autoencoder-Based Anomaly Detection, Insider Threat Detection, Enterprise Security, Real-Time Anomaly Detection, Behavioral Analytics, CERT Insider Threat Dataset, Predictive Risk Management, Cybersecurity Analytics.

ANALYSIS OF GEOLOCATIONAL DATA FOR ACCOMMODATION USING K-MEANS CLUSTERING ALGORITHM

Abstract: In today's rapidly evolving and highly mobile global environment, individuals frequently migrate between cities for education, work, or leisure. One of the most significant hurdles they face is identifying suitable accommodation that aligns with their specific personal preferences, budget constraints, and proximity to essential amenities. While geolocational data is abundant, its sheer volume and complexity make it difficult for average users to extract actionable insights. This project addresses this challenge by developing a data-driven recommendation system that leverages machine learning to analyze and categorize potential living spaces based on their surrounding infrastructure. The core objective of this research is to utilize the K-Means Clustering algorithm to group geolocational data into distinct categories, such as "rich," "average," and "low" amenity zones. By doing so, the system can provide intelligent suggestions that help users find locations similar to their previous livelihood or tailored to their current needs. The methodology begins with comprehensive data collection, where information regarding accommodation types, prices, ratings, and coordinates is gathered into a structured format. This data undergoes rigorous pre-processing, including cleaning, handling missing values, and standardizing features to ensure the accuracy of the clustering process. To obtain precise geographical information, the project integrates the Here Geocoding and Search API v7 and utilizes the FourSquare API for exploratory data analysis. Technical implementation is carried out using Python within the Google Colab environment, employing powerful libraries such as Pandas and NumPy for data manipulation, and Scikit-learn for the K-Means algorithm. The project places a strong emphasis on visualization, using the Elbow Curve method to determine the optimal number of clusters and tools like Folium, Matplotlib, and Seaborn to project these clusters onto interactive maps. Ultimately, this project demonstrates the transformative potential of geolocational analysis in the accommodation sector. By automating the identification of spatial patterns and market segments, the system offers a hassle-free and time-saving solution for travelers and migrants. The findings not only enhance the accuracy of accommodation recommendations but also provide a scalable framework that can be adapted to various urban environments and evolving consumer behaviors.

Keywords: Machine Learning, K-Means Clustering, Geolocational Data, Data Visualization, Here Geocoding API, Exploratory Data Analysis.

IMPLICATIONS OF QUANTUM COMPUTING ON CRYPTOGRAPHY

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Abstract: As quantum computing transitions from theory to engineering reality, the security of global cryptographic infrastructure faces an unprecedented and imminent threat. Shor's algorithm enables exponential speedup of integer factorization and discrete logarithm problems that underpin RSA, ECC, and Diffie–Hellman schemes, while Grover's algorithm delivers quadratic speedup against symmetric encryption and hash functions. A dramatic 2025 breakthrough by Google Quantum AI researcher Craig Gidney reveals that breaking RSA-2048 requires fewer than one million noisy qubits and less than one week of runtime, a 95% reduction from previous 2021 estimates. This paper has synthesized current threat assessments, examining how quantum resource estimates have converged toward feasibility within the 2027–2032 window. By analyzing the "harvest-now, decrypt-later" (HNDL) threat model, where adversaries are actively collecting encrypted data today for retroactive decryption with future quantum computers; creating an immediate vulnerability for long-lived sensitive data. Then a survey of NIST's August 2024 finalization of post-quantum cryptographic (PQC) standards: ML-KEM, ML-DSA, and SLH-DSA, with FN-DSA in draft, providing concrete replacements for classical public-key systems. Complementing these standards, analysis of lattice-based and hash-based algorithm designs, performance benchmarks, and deployment characteristics. Finally, a phased migration strategy spanning 2024–2035, discussing hybrid cryptographic approaches, organizational challenges, and open research problems critical for securing digital infrastructure before cryptographically relevant quantum computers arrive is outlined. By integrating recent resource estimates, the current HNDL threat landscape, and practical standardized solutions, this work provides comprehensive guidance for organizations, practitioners, and policymakers preparing systems for the quantum era.

AI-POWERED RESUME SCREENING AND CANDIDATE RANKING SYSTEM USING NLP AND MACHINE LEARNING

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Abstract: The rapid growth of job applications in modern recruitment processes has made manual resume screening increasingly inefficient, time-consuming, and susceptible to human bias. Organizations often receive hundreds or thousands of applications for a single position, making it challenging for Human Resource (HR) professionals to identify the most suitable candidates accurately and quickly. To address these challenges, this project proposes an AI-Powered Resume Scanner—an intelligent recruitment support system that leverages Artificial Intelligence (AI), Natural Language Processing (NLP), and Machine Learning (ML) techniques to automate the resume evaluation and candidate ranking process. The proposed system extracts and analyzes essential information from resumes, including technical skills, educational background, professional experience, certifications, and relevant keywords. Using NLP techniques, the system processes both structured and unstructured resume formats to identify meaningful patterns and contextual information. It then compares the extracted data with predefined job requirements and computes a compatibility or matching score for each candidate using machine learning algorithms. Based on the calculated scores, the system ranks candidates in order of relevance, enabling HR professionals to quickly shortlist the most qualified applicants. This automated approach not only reduces screening time and operational costs but also minimizes human bias, ensuring a more objective and data-driven hiring process. Furthermore, the system can be implemented as a scalable web-based platform, allowing organizations to manage large volumes of applications efficiently. Overall, the AI-Powered Resume Scanner enhances recruit-ment efficiency, improves hiring accuracy, and supports better decision-making in talent acquisition through intelligent automation and advanced data analysis techniques.

Keywords: Artificial Intelligence, Natural Language Processing (NLP), Machine Learning (ML), Resume Screening, Candidate Ranking.

COMPARATIVE ANALYSIS OF NETWORK FAULT PREDICTION USING DEEP LEARNING TECHNIQUES: LSTM VS CNN MODELS

Abstract: Modern communication networks have become increasingly complex due to the rapid expansion of cloud computing, IoT, and high-speed data services. This growing complexity increases the probability of network faults, which can result in service disruption, performance degradation, and financial loss. Traditional network fault management approaches are mostly reactive and are unable to effectively predict failures in advance. To address these challenges, this project focuses on network fault prediction using deep learning, with a comparative study of Long Short-Term Memory (LSTM) and Convolutional Neural Network (CNN) models. The proposed system utilizes historical network performance data such as latency, packet loss, throughput, CPU utilization, and error rates collected from network devices. The data is pre-processed and organized into suitable formats for deep learning models. LSTM networks are well-suited for analysing time-series data and learning long-term temporal dependencies, making them effective in predicting faults based on historical trends and sequential patterns. In contrast, CNN models are used to automatically extract important features from network traffic patterns or transformed time-series representations. CNNs are efficient in capturing local and spatial correlations and offer faster training and prediction times. Both LSTM and CNN models are trained and evaluated using the same dataset to ensure a fair comparison. The models are evaluated using performance metrics such as accuracy, precision, recall, and F1-score. The comparative analysis demonstrates the strengths of each model and supports the application of deep learning techniques for proactive and intelligent network fault prediction.

AI IN AGRICULTURAL BIOTECHNOLOGY

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Abstract: Soil nutrient imbalance has been identified as a major challenge affecting agricultural productivity and resulting in inefficient fertilizer usage. Accurate assessment of soil nutrient status plays a crucial role in promoting sustainable farming practices and improving crop yield. In this study, a machine learning–based predictive model is proposed to classify soil nutrient status into three categories: Deficient, Optimal, and Excess. The classification is performed using key soil parameters, including Nitrogen, Phosphorus, Potassium, pH, Moisture, Organic Carbon, and Temperature. Due to the limited availability of reliable and structured soil datasets, a synthetic dataset containing 10,000 samples is generated using agriculturally valid parameter ranges and rule-based classification logic to simulate realistic soil conditions. The dataset is divided into training and testing subsets using an 80:20 ratio. A Random Forest classifier is employed for model development because of its robustness and ability to handle complex, nonlinear relationships among soil attributes. Model performance is evaluated using accuracy and standard classification metrics. The experimental results demonstrate that machine learning techniques can effectively predict soil nutrient status with reliable performance. The proposed approach highlights the potential of data-driven methods in supporting agricultural decision-making. By enabling accurate nutrient classification, this model can assist farmers in optimizing fertilizer application, reducing resource wastage, and promoting sustainable soil management practices.

Keywords: Soil Nutrient Analysis, Machine Learning, Random Forest, Synthetic Dataset, Sustainable Agriculture, Fertilizer Optimization.

CRIME TYPE AND OCCURRENCE PREDICTION USING MACHINE LEARNING ALGORITHM

Abstract: Public safety is enhanced by predicting criminal activities before they occur. This project develops a crime type and occurrence prediction system using machine learning algorithms. Analyzing historical crime data, location, and time, the model identifies patterns and hotspots. Law enforcement agencies can allocate resources effectively based on these predictions. The system classifies crime types and forecasts potential incidents, enabling preventive measures. Methodologies include regression and classification techniques trained on public datasets. The goal is to reduce crime rates and improve response times. By providing actionable intelligence, this tool supports strategic policing. Ethical considerations are maintained to prevent bias. Ultimately, the system fosters safer communities through data-driven decision-making and proactive law enforcement strategies.

AI- SCRABBLE GAME USING NLP-BASED WORD PREDICTION AND DIFFICULTY ADJUSTMENT ALGORITHMS

Abstract: The traditional Scrabble game challenges players to form meaningful words using randomly assigned tiles, but many beginners struggle with vocabulary limitations and difficulty progression. To address these challenges, this project proposes an AI- Scrabble game that integrates Natural Language Processing (NLP) based word prediction and dynamic difficulty adjustment algorithms to enhance gameplay, learning, and engagement. The system uses NLP techniques and a trained language model to analyze available letter tiles and predict valid high-scoring word suggestions, helping players learn new vocabulary and im-prove word-formation skills. Additionally, the difficulty adjustment engine monitors player perfor-mance, game history, and word accuracy to automatically modify the complexity level by adjusting tile distribution, scoring system, and suggestion frequency. This adaptive mechanism ensures that both beginners and advanced users experience a balanced and motivating gameplay environment. The proposed system enhances traditional Scrabble by combining educational value with AI-driven gameplay support. It promotes vocabulary building, strategic thinking, and personalized learning through intelligent recommendations and adaptive difficulty. The application can be deployed for educational language learning, competitive gameplay, or entertainment, benefiting students, ESL learners, and casual players.

CYBER SECURITY THREATS AND COUNTERMEASURES IN IOT

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Abstract: The Internet of Things (IoT) connects smart devices across networks to enable automation and real-time data exchange. However, the rapid growth of IoT systems has increased security risks due to weak authentication, limited device resources, and poor security configurations. IoT environments are vulnerable to threats such as malware, DDoS attacks, data breaches, and unauthorized access. This paper discusses major cybersecurity threats in IoT and presents effective countermeasures including encryption, secure authentication, firmware updates, network monitoring, and intrusion detection systems.

Keywords: Internet of Things (IoT), Cyber Security, IoT Threats, DDoS, Malware, Encryption, Authentication, Intrusion Detection System, Network Security.

GESTURESENSE: NORMALIZED TEMPORAL LANDMARK-BASED REAL-TIME INDIAN SIGN LANGUAGE RECOGNITION AND TRANSLATION FRAMEWORK

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Abstract: Millions of hearing impaired people in India use Indian Sign language (ISL) to communicate and no real time automation translation exists. Towards the same we propose a lightweight and normalized temporal landmark based hand detection approach for real time ISL recognition. From each hand using the web cam, we extracted 21 hand landmarks (using MediaPipe).To account for any anomalies, we normalized the gestures using a 4 stage process to remove variations in hand size, camera distance and angle while ensuring that the inherent structure of the gesture is preserved and passed on to be classified. We also utilized a sliding window LSTM based temporal model to account for the variability in the frame level classification which occurs due to the instability in predictions for short term motion of gestures between frames. We adopted a confidence aware smoothing approach for filtering where we integrated threshold filtering, majority voting and stability timing to remove the unstable and undesired predictions. This method we propose is capable of processing continuous video streams in real time with a model size that can be conveniently deployed on edge devices that suffer from data constraints. In this work, we performed experiments on a custom collected dataset of ISL alphabet consisting of 150 samples per class for 29 classes. The performance was evaluated in terms of accuracy, per class F1 score, latency and computational resources. Ablation studies were performed to understand the effects of individual normalization stages and to verify the necessity of using temporal models over frame based classification.

Keywords: Mediapipe, frame level classification, Confidence aware smoothing approach, threshold filtering, stability timing.

COUNTERFACTUAL CAUSAL EXPLAINABLE AI FOR EARLY INTERVENTION IN AUTISM SPECTRUM DISORDER USING BEHAVIORAL AND CLINICAL FEATURES

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Abstract: Autism Spectrum Disorder (ASD) is a complicated neurodevelopmental disorder that is associated with the disabilities in communication, social interaction, and behavioral patterns. Early diagnosis is very important to make the intervention effective; the traditional methods of diagnosis are usually subjective, time-consuming, and rely on the expert review. This paper presents a causality-based explainable machine learning model to predict early ASD on behavioral screening data. It is a set of 1054 cases comprised of 19 variables, namely Autism Quotient (AQ) scores, Qchat score, and clinical variables: family history and developmental indicators. The framework proposed is an integration of data preprocessing, correlation analysis, machine learning classification, and causal inference, to give each a predictive performance and interpretability. Random Forest and XGBoost ensemble models are used in order to obtain high classification accuracy, whereas the structural causal modeling approach is used to determine causal relationships between key variables and ASD outcomes. According to experimental findings, experimental findings show that behavioral features, especially the Qchat score and select AQ attributes, have a high level of influence on the prediction of ASD (some of them have strong causal effects).They are further improved by visualization, such as heatmaps, ROC curves, and feature distribution plots. The given approach offers clinically significant information, unlike a traditional black-box model where it is not possible to distinguish between correlation and causation. The framework enhances credibility and facilitates the process of decision making during early screening of ASD. This paper identifies the opportunities of integrating machine learning, causal inference, and explainable AI to design reliable and interpretable healthcare solutions.

Keywords: Autism Spectrum Disorder (ASD), Causal Inference, Random Forest, XGBoost, Qchat Score.

USEDCAR PRICE PREDICTION MODEL: A MACHINE LEARNING APPROACH

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Abstract: The impact of the Covid-19 pandemic over the past two years has slowed down the economy, including the market of used cars. However, the recent decline in the number of cases infected with Covid-19 has reignited interest in the used car market. One of many persisting issues found in the used car market is that sellers want the highest price possible; but, buyers and used car dealers bid the lowest price due to economic stability uncertainty. To accelerate the recovery of the used car industry, various innovations are required. This study proposes the use of the K-Nearest Neighbors (KNN) regression model to predict used car prices to address this issue. The proposed KNN model is a machine learning algorithm which is capable of handling multidimensional data and its robustness to noisy data, making it suitable for predicting used car prices based on multiple factors. By analyzing collected data on used car prices, a machine learning- based regression model can be developed to predict used car prices based on factors commonly used in the used car industry, such as year of production, cartype, car condition, and others. Thisstudy makes use of 504 used car data collected through web scraping as a secondary data collection method. With a relatively small error rate of 8.3% and an R2 value of 98.8%, the results of this analysis can provide insight for used car buyers and sellers, to better gauge the price of used cars in the market.

Keywords: Used Cars, Machine Learning, Multiple Linear Regression, Polynomial Regression, K-Neighbors Regression.

DEEP LEARNING IN MEDICAL IMAGE ANALYSIS: STATE OF THE ART AND OPEN CHALLENGES

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Abstract: Medical image analysis plays a vital role in healthcare by supporting accurate disease diagnosis and severity assessment. The rapid growth of imaging modalities such as Computed Tomography (CT), X-ray, and Magnetic Resonance Imaging (MRI), combined with advances in deep learning, has led to significant improvements in automated medical image interpretation. This paper presents a systematic review of state-of-the-art deep learning techniques for medical image analysis, to ensure a structured and reproducible review process. The selected studies are analyzed qualitatively and categorized based on deep learning architectures, including convolutional neural networks, transfer learning models, and hybrid approaches, with a focus on disease detection, classification, and severity prediction. Comparative analysis of reported performance metrics highlights the effectiveness and limitations of existing methods across different imaging modalities. Furthermore, key challenges such as limited annotated data, class imbalance, lack of interpretability, generalization issues, and clinical deployment constraints are discussed. The findings summarize current advancements, iden-tify open research challenges, and outlines future research directions to facilitate the development of robust and clinically applicable deep learning–based medical image analysis systems.

Keywords: Medical Image Analysis, Deep Learning, Convolutional Neural Networks, Disease Diagnosis

PLANT DISEASE DETECTION AND RECOMMENDATION SYSTEM USING LLM

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Abstract: Plant diseases significantly reduce crop yield and directly impact food security, especially in developing agricultural regions. Early and accurate disease identification remains a major challenge due to limited access to experts and language barriers faced by farmers. This paper presents an AI-based end-to-end plant disease detection and advisory system that integrates deep learning, multilingual support, and intelligent recommendation generation. The proposed system employs an EfficientNet-B0 convolutional neural network to classify plant leaf images into multiple disease categories.U NET for severity Identification, A FastAPI-based backend enables real-time image analysis, while a large language model (LLM) generates concise, crop-specific treatment and prevention recommendations in multiple regional languages. Additionally, a text-to-speech module converts recommendations into audio for better accessibility. Experimental evaluation on the PlantVillage dataset demonstrates high classification accuracy and efficient inference. The proposed framework offers a scalable, farmer-friendly solution for smart agriculture and sustainable crop management.

Keywords: Plant disease detection, EfficientNet, Deep learning, Multilingual advisory system, Large language models, Smart agriculture, Plant, U NET

A REVIEW ON RELIABILITY ESTIMATION OF K-OUT-OF-N SYSTEM WITH CENSORED DATA

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Abstract: The k-out-of-n system is a fundamental reliability structure that operates successfully if at least k out of n components function. This model generalizes classical series (1-out-of-n) and parallel (n-out-of-n) systems and has extensive applications in engineering, industrial systems, communication networks, and biomedical devices. In practical life-testing experiments, complete lifetime data are rarely observed due to time limitations, cost constraints, or early termination of experiments, leading to various forms of censored data such as Type-I, Type-II, hybrid, and progressive censoring. Reliability estimation under censoring therefore becomes a critical statistical challenge. This review synthesizes the existing literature on reliability estimation methods for k-out-of-n systems under censored samples. It discusses classical frequentist approaches including maximum likelihood estimation and confidence interval construction, Bayesian estimation using conjugate and non-informative priors, nonparametric and semi-parametric methods, as well as recent computational techniques such as EM algorithms and Markov Chain Monte Carlo methods. The review also highlights developments under different lifetime distributions including exponential, Weibull, gamma, and generalized models. Comparative insights, practical limitations, and future research directions are presented to guide further advancements in reliability analysis of complex systems under censoring schemes.

Keywords: Reliability Engineering, Maximum Likelihood Estimation, Time-to-Failure Analysis, Censored Lifetime Data

TRIPLE-INPUT MULTI-SCALE TRANSFORMER WITH RELATIVE ATTENTION FOR MELANOMA CLASSIFICATION

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ABSTRACT: Early and accurate detection of melanoma remains a challenging task due to inter-class similarities, intra-class variations, illumination artefacts, and the presence of occlusions such as hair and reflections in dermoscopic images. Although convolutional neural networks have demonstrated promising performance in skin lesion classification, their ability to capture long-range contextual dependencies and discriminative lesion regions remains limited. To address these challenges, this paper proposes TriMS-TransNet, a novel Triple-Input Multi-Scale Transformer Network for multi-class skin lesion classification. The model is evaluated on the publicly available ISIC 2019 and PAD20 datasets, along with INMOP texture pattern images derived from ISIC 2019. Experimental results demonstrate that TriMS-TransNet achieves an overall classification accuracy of 94.82%, with a precision of 93.97%, recall of 94.21%, and F1-score of 94.08%. The proposed multi-scale reconstruction combined with transformer-based attention significantly improves melanoma detection performance while maintaining balanced multi-class classification capability. The results indicate that the proposed framework can serve as a reliable computer-aided diagnostic tool to assist dermatologists in early melanoma detection and clinical decision-making.

KEYWORDS: Melanoma, Dermoscopy Images, Classification, Attention Mechanism, Multi Scale Transformer.

E-COMMERCE SALES FROM AMAZON REVIEWS USING SUPPORT VECTOR MACHINE AND LSTM NETWORKS

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ABSTRACT: The rapid growth of e-commerce platforms has generated massive volumes of user-generated content in the form of online product reviews, offering valuable insights into customer sentiment and purchasing behavior. Effectively leveraging this unstructured and temporally evolving data for predictive modeling remains a significant challenge. Accurate sales and purchase behavior prediction is essential for inventory planning, demand forecasting, and strategic decision-making in competitive e-commerce environments. This study presents a comprehensive comparative analysis of Support Vector Machine (SVM) and Long Short-Term Memory (LSTM) networks for sentiment-aware predictive modeling in e-commerce. Using large-scale Amazon product review data comprising textual reviews, ratings, and timestamps, both classical machine learning and deep learning approaches are implemented and evaluated. The proposed methodology integrates text preprocessing, sentiment extraction, feature engineering, and temporal aggregation to enhance predictive accuracy. Experimental results demonstrate that SVM provides a computationally efficient baseline with competitive performance in sentiment-based prediction tasks, while LSTM significantly outperforms SVM in capturing sequential and temporal dependencies inherent in review data. The findings confirm that incorporating sentiment and temporal dynamics substantially improves sales forecasting accuracy. This research offers practical guidance for selecting appropriate predictive models based on performance, scalability, and computational constraints, contributing to the advancement of intelligent decision-support systems in e-commerce platforms.

KEYWORDS: E-Commerce Analytics, Sales Forecasting, Sentiment Analysis, Support Vector Machine, Long Short-Term Memory, Predictive Modeling, Online Product Reviews, Machine Learning and Deep Learning.

IMAGE FORGERY DETECTION USING ERROR LEVEL ANALYSIS AND DIGITAL IMAGE FORENSICS

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ABSTRACT: The Image Forgery Detection System is a web application based on computer vision that uses passive image forensics techniques to detect digital images that have been altered or tampered with. The system looks at basic features of images to detect deepfakes , as compared to methods that use metadata or embedded watermarks. It employs Error Level Analysis (ELA) to show differences in JPEG compression, noise pattern inspection for detecting statistical errors, and border inconsistency detection to identify unnatural structural boundaries. The software is build in Python 3.10 using Flask as the web framework, and image processing is with using OpenCV, Pillow, NumPy, and scikit-image. Users may upload images in an online page. Preprocessing techniques such as colours space conversion and resizing are done before analysis.The system highlights suspicious regions and generates PDF-based forensic reports. The proposed solution demonstrates an effective integration of classical image processing and web technologies for digital image authentication in academic, forensic, and media applications

KEYWORDS: Image Forgery Detection, Error Level Analysis (ELA), Digital Image Forensics, Computer Vision, Flask Web Application

REAL-TIME NONLINEAR TRAFFIC MANAGEMENT FOR GRIDLOCK MITIGATION IN URBAN ROAD NETWORKS

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Abstract: Urban traffic congestion significantly impacts the efficiency and reliability of city transportation networks. This work introduces a nonlinear traffic management framework designed to prevent gridlock by dynamically controlling vehicle densities. Nonlinear mathematical models are employed to identify critical thresholds where traffic flow may unexpectedly collapse. As traffic approaches these limits, adaptive measures regulate inflow and optimize signal timings across arterial networks, maintaining smooth movement and avoiding congestion. Analysis of historical urban vehicular movement data since early 2024 indicates potential reductions in travel delays of up to 40%. The framework improves traffic efficiency, reliability, and resilience, providing planners with practical tools for proactive interventions and ensuring robust performance under peak demand conditions.

Keywords: Nonlinear traffic modelling, dynamic density control, congestion prevention, adaptive signal control, urban traffic optimization.

LOCATION BASED REMAINDER APPLICATION USING GEOFENCING

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Abstract : In today's fast-paced and highly mobile lifestyle, individuals often forget important tasks due to busy schedules and dynamic movement between locations. Traditional reminder systems are primarily time-based and may trigger alerts at inappropriate or inconvenient moments. To overcome this limitation, this project proposes an Android-based Location Based Reminder Application that delivers intelligent alerts based on the user's geographical position. The core objective of this project is to implement geofencing technology to detect when a user enters a predefined geographic area and automatically trigger relevant reminders. The system leverages GPS and Google Maps API to monitor location boundaries efficiently while optimizing battery consumption. Reminder data, including task details, location coordinates, and radius settings, is stored locally using SQLite to ensure offline functionality and reliable performance even without continuous internet connectivity.

The application is designed and developed using Android Studio and Java, integrating Android SDK components for background location tracking and notification management. The system architecture ensures accurate detection, efficient data handling, and smooth user interaction. By introducing context-aware alerting, the proposed system enhances task management, reduces missed activities, and improves overall productivity. Ultimately, this project demonstrates the effectiveness of location-aware computing in everyday applications and provides a scalable framework that can be extended with cloud synchronization, intelligent reminder suggestions, and cross-device integration in future developments.

The system continuously monitors the user's location in the background using optimized location services to minimize battery consumption. Geofence boundaries are defined using latitude, longitude, and customizable radius parameters for accurate detection. Push notifications are generated instantly when the user enters the specified location zone. The application ensures secure local data handling and efficient database management. The user interface is designed to be simple, interactive, and easy to configure for all types of users. This solution enhances real-time task management by combining mobility, automation, and intelligent location tracking.

KEYWORDS : Location-Based Reminder, Geofencing, GPS, Android Application, Google Maps API, SQLite Database, Location-Aware System, Mobile Computing, Context-Aware Alerting, Android SDK.

MODELLING STUDENT INFORMATION LITERACY THROUGH LEARNING BEHAVIOURS USING MACHINE LEARNING

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ABSTRACT: Predicting student performance in information literacy courses before summative assessments remain a significant challenge in educational data mining. This study proposes a machine learning pipeline that leverages Learning Management System (LMS) interaction logs to forecast final grade outcomes for 320 undergraduates enrolled in a sixteen-week information literacy course at a Chinese university. Twenty-three behavioural features spanning resource-access patterns, quiz attempts, discussion participation, assignment-submission timing, and information-thinking task scores were extracted from LMS records. Pearson correlation filtering reduced the feature set to twelve high-signal variables, preserving model interpretability. Six classifiers were evaluated under a common protocol: Decision Tree, k-Nearest Neighbours, Naive Bayes, Multi-Layer Perceptron, Random Forest, and XGBoost. Grade prediction was framed as a four-class problem (Excellent, Good, Pass, Fail) rather than a binary outcome to provide finer-grained insight into student risk levels. Random Forest achieved 92.50% accuracy with a Cohen's Kappa of 0.859 and a recall of 94.81%, while XGBoost outperformed all models with 93.00% accuracy, 95.10% recall, and an F1 score of 91.00%. Feature importance analysis identified information-thinking tasks and active application exercises as the dominant predictors, whereas passive resource-access frequency ranked comparatively low. These findings suggest that instructional designs emphasising active synthesis tasks over reading-list expansion produce more predictable and improved literacy outcomes. The proposed pipeline operates on standard hardware using publicly available Python libraries, making it a low-barrier tool for LMS-based institutions seeking early, data-driven intervention strategies.

KEYWORDS: Information Literacy; Learning Behaviour Analytics; Machine Learning; Educational Data mining; Random Forest; XGBoost.

AUTO-SCALING OF ML MODELS USING REAL-TIME PREDICTIVE MONITORING

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ABSTRACT: Cloud computing environments host applications with dynamic and unpredictable workloads. This makes efficient resource management a critical need. This often leads to performance drops, violations of service-level agreements (SLAs), and wasted cloud resources. This paper introduces CloudPulse, a real-time predictive autoscaling and monitoring system that uses continuous system monitoring along with machine learning for forecasting. CloudPulse continuously gathers real-time metrics such as CPU usage, memory use, and network activity from distributed nodes. It uses a combination of Long ShortTerm Memory (LSTM) networks and Facebook Prophet time-series forecasting models to predict future resource demands over a 5 to 15-minute period. The system automatically adjusts resources based on current and forecasted workload trends to avoid performance issues before they happen. It includes lightweight monitoring agents built with Go, a centralized control and visualization layer in Node.js, and an intelligent forecasting engine in Python. CloudPulse supports container deployment through Docker and works with Kubernetes for automated management. Testing across four workload scenarios—steady load, gradual increase, sudden spike, and fluctuating load—shows that predictive autoscaling cuts average scaling time from 30 to 60 seconds when reactive to just 5 to 10 seconds with predictive methods. It also reduces SLA violations and improves overall resource use compared to traditional reactive techniques.

KEYWORDS: Predictive autoscaling; machine learning; LSTM; Facebook Prophet; cloud computing; Kubernetes; Docker; resource management; SLA; microservices; real-time monitoring; time-series forecasting.

A COMPREHENSIVE SURVEY ON HYBRID MACHINE LEARNING AND QUANTUM NEURAL NETWORK APPROACHES FOR CROWD DENSITY ESTIMATION AND COUNTING: CHALLENGES, METHODS, AND FUTURE DIRECTIONS

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ABSTRACT: In computer vision, Estimating Crowd density and people counting are core tasks for public safety, transportation, and urban analytics. Although Deep CNN-based density map regression has become the dominant paradigm, it remains challenged by severe occlusion, extreme density variation, scale/perspective distortion, and real-time constraints. In parallel, advances in Noisy Intermediate-Scale Quantum (NISQ) computing has enabled hybrid classical–quantum learning, in which classical networks produce compact features and parameterized quantum circuits (QNNs, VQCs, QCNNs) function as lightweight decision modules. This survey presents a comprehensive review of (i) classical crowd counting and density estimation methods, (ii) quantum neural networks and hybrid quantum machine learning, and (iii) the emerging intersection of both fields. A key gap is identified: the lack of established studies that apply QNNs to density-map-derived crowd features for downstream density inferences. To bridge this gap, we propose a near-term hybrid blueprint that integrates CNN-based density/feature extraction, feature compression to qubit-compatible vectors, quantum classification/regression heads and density-category prediction and auxiliary tasks. The survey concludes with discussion of evaluation priorities and research directions toward reproducible, hybrid crowd analytics.

KEYWORDS: Crowd Density Estimation, Crowd Counting, Quantum Neural Networks, Hybrid Machine Learning, NISQ Computing

DEFECTECHO: MULTI-FAULT PCB DEFECT DETECTION USING YOLO-11 WWBI DEEP LEARNING

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ABSTRACT —Printed Circuit Board (PCB) defect detection is a critical task in modern electronics manufacturing, where micro-level faults such as spurs, open circuits, shorts, and spurious copper can significantly impact device reliability and production yield. Conventional inspection techniques, including manual visual inspection, template matching, and MATLAB-based image processing systems, are labor-intensive, inconsistent, and unsuitable for real-time industrial deployment. Although recent deep learning approaches such as CNNs and baseline YOLO models have improved detection accuracy, they still face challenges in multi-scale feature representation and precise localization of tiny PCB defects.

To address these limitations, this paper proposes DefectEcho, a real-time multi-fault PCB defect detection framework based on the optimized YOLO-WWBi (YOLOv11) architecture. The proposed model integrates advanced modules including WRGMSFA for enhanced small-object feature amplification, BiFPN for bidirectional multi-scale feature fusion, and WIoU v3 for improved bounding-box regression and localization accuracy. The system extends the original architecture to detect nine industrially relevant PCB defect categories, thereby improving defect coverage and practical applicability.

Experimental evaluation on annotated PCB datasets demonstrates superior performance in terms of precision, recall, F1-score, and mean Average Precision (mAP), particularly for fine-grained and micro-level defects. The proposed framework supports real-time inference and scalable deployment for Automated Optical Inspection (AOI) systems. By combining optimized deep learning architecture with real-time processing capability, DefectEcho provides an efficient, robust, and industry-ready solution for intelligent PCB quality inspection.

KEYWORDS —PCB Defect Detection, YOLO-WWBi, YOLOv11, Deep Learning, Small-Object Detection, BiFPN, WIoU v3, Automated Optical Inspection (AOI), Real-Time Industrial Inspection.

VISION-DRIVEN BIDIRECTIONAL TRANSLATION FRAMEWORK FOR INDIAN SIGN LANGUAGE USING LSTM NETWORKS

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ABSTRACT: Communication barriers between deaf-mute individuals and hearing-speaking people remain a significant challenge, particularly in regions where sign language interpretation resources are limited. Indian Sign Language (ISL), while widely used by the deaf community in India, lacks sufficient technological support for real-time, bidirectional translation. This paper proposes a real-time two-way communication system that enables seamless interaction between deaf-mute and hearing-speaking individuals using computer vision and deep learning techniques. The proposed system consists of two core modules: Sign-to-Text/Speech and Text/Speech-toSign. Hand gesture videos are captured using a standard webcam and processed with MediaPipe to extract hand and body landmarks. Temporal gesture sequences are recognized using a Long Short-Term Memory (LSTM) network trained on a custom ISL dataset. Recognized gestures are converted into readable text and synthesized speech. Conversely, typed or spoken English input is translated into corresponding pre-recorded ISL gesture videos, enabling effective visual communication for deaf-mute users. The system operates in real time, requires minimal hardware, and performs efficiently on a limited vocabulary dataset. Experimental results demonstrate accurate gesture recognition and smooth two-way interaction. The proposed approach offers a scalable foundation for inclusive communication systems and can be extended to support sentence-level translation, larger vocabularies, and mobile or web-based deployment in future work.

KEYWORDS: Indian Sign Language, Gesture Recognition, MediaPipe, LSTM, Human– Computer Interaction, Assistive Technology

SANJAYA - CAMPUS TRACKING INTELLIGENCE

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ABSTRACT—The majority of campuses continue to use the old fashioned ways like writing down into a book, keeping an eye on the student with a camera and a record, swipe card entry and swipe card exit to keep track of who is doing what? More complex cases that are to be micro-managed. Such produces are not very easy to operate particularly when the campus is relatively big. Hand processing, attention to details and make more work situations dominate. In the attempt to overcome these challenges, this paper work proposes a Campus Tracking Intelligent Network System to oversee people and activities in the campus in real time. This is an automatic system to track people in campus. It logs through movements, and sends notifications of alert, where necessary, and shows it all on a basic dashboard. The proper tracking is considered in this Project as well as the speed and smoothness of the system working. The system operates well on standard computers with smaller proportion of delay. The System maintains the campuses safe and it is easier to track the information and keep the information secure at the same time. The System is accessible to the trusted people who can view or manipulate the records. The system maintains data in proper and secure ways.

KEYWORDS— Indoor Location tracking, Wi-Fi Signal Analysis, RSSI-Based Positioning, Real-Time Location Update, IOT Deployment.

PERSONALIZED STYLE RECOMMENDATION SYSTEM (STYLEGENIE)

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ABSTRACT : The excessive number of choices make it hard for customers to make decisions. This is what is known as “information overload”. Everyone has their preferences when it comes to shopping for clothes online. Some prefer certain styles; some have body shapes to account for or perhaps care about colour coordination. The lack of support for these preferences lead to a frustrating shopping experience and high product return rates. In this project, we want to develop a product that can help customers by recommending them outfits. These outfit recommendations will be based on user input about their preferences as well as existing fashion principles. The project uses a rule-based approach to simulate fashion expertise. Key steps are Categorisation by attributes, Decision Logic and Interface. With this project we seek to show the effectiveness of rule-based systems when faced with reducing huge datasets into a few manageable options. The prototype is promising as it was able to successfully identify outfits which are both coordinated and match with user preferences. This project shows that personalized styling can be done through simple algorithms. It provides useful functionality for e-commerce platforms and improves user satisfaction by offering more relevant, tailored fashion choices.

KEYWORDS: Information Overload, Personalized Recommendation System, Rule-Based System, Fashion Styling Algorithm, E-commerce Optimization, User Preference Modelling.

COGNITIVE RADIO BASED SPECTRUM SENSING AND ALLOCATION USING DEEP LEARNING TECHNOLOGY

ABSTRACT: Cognitive Radio (CR) technology is an emerging solution to overcome the problem of spectrum scarcity in wireless communication systems. Traditional static spectrum allocation leads to inefficient utilization of available frequency bands, causing congestion and interference. This project proposes an intelligent spectrum sensing and allocation method using Deep Learning techniques to improve spectrum efficiency and communication reliability. The system continuously monitors the radio frequency environment and detects unused spectrum bands by analyzing signal patterns using trained neural network models. Deep Learning algorithms enable accurate identification of primary user signals and dynamically allocate spectrum resources to secondary users without causing harmful interference. The proposed approach enhances spectrum utilization, reduces energy consumption, and improves overall network performance compared to conventional sensing techniques. This method ensures adaptive and real-time decision-making in wireless networks, making it suitable for next-generation communication systems such as 5G and beyond. The implementation of this system provides an efficient, reliable, and intelligent spectrum management framework for future wireless communication environments

ERGOWATCH: A REAL-TIME COMPUTER VISION BASED POSTURE AND EYE MONITORING SYSTEM

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ABSTRACT: Ergo watch is a real-time ergonomic monitoring system designed to detect improper posture and abnormal blink patterns during prolonged computer usage. The system aims to reduce digital eye strain, forward head posture, and shoulder misalignment by providing continuous visual feedback and corrective alerts. It utilizes the pretrained landmark detection framework of Media Pipe to extract facial and upper-body key points from live video input. The framework generates normalized three-dimensional facial and shoulder coordinates, which are converted into pixel values for accurate geometric computation. Instead of training a custom machine learning model, Ergo Watch employs mathematical and geometric analysis techniques. The Euclidean distance formula estimates face-to-screen distance, the Eye Aspect Ratio (EAR) detects blink events, and vector-based angular computations evaluate shoulder alignment. These computed parameters are compared against empirically defined threshold values to classify posture correctness and blink frequency in real time. This threshold-based approach ensures interpretability, low computational complexity, and efficient frame-by-frame processing. Implemented using Python, Open CV, and PyQt, the system maintains minimal latency and supports continuous monitoring. Ergo Watch provides a scalable and practical solution for promoting ergonomic awareness in work-from-home, academic, and corporate environments without requiring additional model training.

KEYWORDS: Real-time Monitoring, Ergonomics, Eye Aspect Ratio, Media Pipe, Posture Detection

AI – BASED LOGO SIMILARITY CHECKER.

ABSTRACT : Brand identity protection is crucial in business. This project introduces an AI-based logo similarity checker to detect potential trademark infringements. Using computer vision and deep learning, the system compares new logo designs against existing databases. It identifies visual similarities in shape, color, and structure that might confuse consumers. The tool assists legal teams and designers in ensuring originality before registration. Methodologies include feature extraction and similarity scoring. The system reduces manual effort and increases accuracy in infringement detection. By preventing legal disputes, it saves time and resources. This innovation supports intellectual property rights, ensuring brands maintain unique identities in a crowded marketplace through automated, precise visual analysis capabilities.

TNC RISK ANALYSER USING NLP FOR AUTOMATIC TERMS AND CONDITIONS RISK DETECTION

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ABSTRACT: Terms and Conditions (T&C) documents govern user rights across digital platforms, yet most users accept them without fully understanding the legal implications due to document length and complex language. This often results in hidden financial obligations, privacy risks, and restrictive legal clauses. This paper presents an NLP-based TnC Risk Analyzers designed to automatically detect potentially risky clauses in legal agreements. The proposed system supports multi-format input acquisition including direct text, PDF documents, and website URLs. Extracted content undergoes semantic-preserving preprocessing and clause-level segmentation to convert lengthy policies into structured legal statements suitable for analysis. Each clause is transformed into numerical representations using TF-IDF, and a supervised classification model is employed to identify risk categories such as financial risk, privacy risk, and legal restriction risk. Experimental evaluation demonstrates reliable clause segmentation and effective risk identification across heterogeneous T&C documents. The proposed framework enhances transparency and supports informed decision-making in digital agreements.

KEYWORDS: Natural Language Processing, Legal Text Analysis, Clause Segmentation, TF-IDF, Risk Classification, Computational Intelligence

A CROSS-RAIL POLICY DSL AND DETERMINISTIC RUNTIME VERIFIER FOR SECURE DELEGATED AGENTIC PAYMENTS

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ABSTRACT: Autonomous AI agents are becoming increasingly capable of completing transactions on behalf of users. However, without real-time enforcement of user-defined regulations, such systems are prone to risks including excessive spending, merchant fraud, subscription abuse, and inconsistent policy application across payment channels This paper introduces a domain specific language (DSL), termed Cross rail Policy, along with a deterministic runtime verifier designed to securely enforce delegated spending policies in agentic commerce. The DSL allows users to define clear constraints such as spending quotas, vendor and category restrictions, time frames, and approval requirements. The verifier ensures compliance across multiple payment channels such as simulated card-based tokens and HTTP 402 micropayments by producing deterministic runtime decisions rather than relying on probabilistic AI based reasoning. The system is implemented and tested under adversarial conditions, demonstrating high policy compliance with low latency. This solution of ers a scalable and secure control-plane architecture for policy-governed agentic payments.

KEYWORDS: - Agentic payments, delegated spending, domain-specific language (DSL), runtime policy enforcement, AI agents, payment rails, HTTP 402, secure transactions, cross-rail systems, deterministic verification.

TO DESIGN AND IMPLEMENT BIOMETRIC HEALTH SCORE CALCULATOR USING PPG SENSOR

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ABSTRACT: This project presents the design and implementation of a Biometric Health Score Calculator using a Photoplethysmography (PPG) sensor, aimed at providing a simple, real-time assessment of an individual's cardiovascular health. The central idea of this work is to develop a non-invasive, costeffective system that collects pulse wave signals through a PPG sensor and processes them to generate a comprehensive health score. The system captures heart rate and related pulse characteristics, filters and analyzes the signal using embedded processing techniques, and applies an algorithm to compute a normalized biometric health score. Key components include signal acquisition, noise reduction, feature extraction, and score calculation, all integrated into a compact hardware–software platform. The proposed solution emphasizes accessibility, portability, and continuous monitoring, making it suitable for personal health tracking and preventive care. The results demonstrate that PPG-based measurements can be effectively translated into meaningful health indicators. This project highlights the potential application of wearable and IoT-based health monitoring systems in early detection of cardiovascular irregularities and promotes proactive health management through affordable technology.

KEYWORDS: Photoplethysmography (PPG), Biometric Health Score, Cardiovascular Monitoring, Heart Rate Variability (HRV), Signal Processing, Pulse Wave Analysis, Embedded Systems, Wearrable Health Technology, Non-Invasive Diagnostics, Internet of Things (IoT) Healthcare.

DEEP LEARNING-BASED IMAGE SEGMENTATION FOR MULTIORGAN CANCER DETECTION IN HISTOPATHOLOGICAL IMAGES

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ABSTRACT: The automated segmentation of nuclei in digital pathology is a critical prerequisite that heavily influences the precision of cancer grading and subsequent diagnostic workflows. This study introduces a high-performance deep learning framework designed to address these tasks using the MoNuSeg 2018 multi-organ dataset. To manage the complexities of high-resolution histopathological slides and staining variations, we implemented a standardized preprocessing pipeline utilizing Min-Max normalization and 256x256 spatial patching. The core of our approach utilizes an Attention-Gated U-Net (AG-UNet), which leverages internal gating mechanisms to emphasize important nuclear morphology while filtering out distracting stromal background features. We optimized the model over 50 epochs using a Hybrid Dice-BCE loss function specifically chosen to mitigate class imbalance and refine boundary detection. Our experimental findings demonstrate strong numerical stability and performance, reaching a Global Accuracy of 91.84% and a Dice Coefficient of 0.8510. Furthermore, we integrated Grad-CAM heat maps to provide a layer of Explainable AI (XAI), enabling visual verification of the model's diagnostic focus. These results indicate that the proposed framework offers superior generalizability and transparency for clinical decision-support systems across diverse organ tissues.

KEYWORDS: Attention-Gated U-Net, Multi-Organ Segmentation, Explainable AI (XAI), Grad-CAM, MoNuSeg 2018 Dataset, Hybrid Dice-BCE Loss

MULTIMODAL DETECTION AND NETWORK ANALYSIS OF CLIMATE CHANGE ISINFORMATION ACROSS SOCIAL MEDIA PLATFORMS

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ABSTRACT: The rapid growth of digital communication platforms has increased the global issue of misinformation, especially in climate change. This review summarizes research published between 2020 and 2025 which examines approaches to finding and reducing misinformation across major social media platforms. The study highlights developments in transformer-based natural language processing models, multimodal detection systems and network analysis. The findings show a shift from traditional machine learning classifiers to transformer-based and multimodal architectures that combine text, images, and network features. The detection accuracy has greatly improved but challenges still exist. These include the ability to generalize across different platforms, explain detection results, consider cultural differences, and adapt in real time. Moreover, inconsistent enforcement and the rise of synthetic media make it hard to tackle these issues. The review also points out the need for multi-language datasets, standard evaluation measures, and frameworks for collaboration across different fields. The paper suggests a combined, clear, and cross-platform research plan to improve reliability, transparency, and resilience in digital information systems. The findings offer practical insights for researchers, policymakers, and platform designers working to fight misinformation worldwide.

KEYWORDS: - Climate Misinformation Detection, Social Media Monitoring, Deep Learning, Explainable AI.

AUTOMATED LUNG DISEASE CLASSIFICATION USING VISION TRANSFORMER AND EXPLAINABLE AI

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ABSTRACT: The timely and precise diagnosis of lung diseases is the key to successful clinical treatment and patient care. The recent developments in deep learning have been promising in automated analysis of medical images, but a challenge is that high accuracy can be attained and at the same time the interpretation is understandable. It is a paper that demonstrates a ViT-based framework to classify lung diseases into multiple classes using X-ray medical images. The proposed system will categorize four lung conditions, i.e., Pneumonia, Tuberculosis, Lung Cancer, and Normal cases. The transfer learning approach is used to train a pre-trained Vision Transformer model, in which the transformer backbone component is kept, and a task-specific classification head is trained to transform the model to lung disease diagnosis. The dataset's is professionalized into training, validation and testing to make sure no bias is observed in the performance assessment. To overcome a computation limitation, the transformer backbone is frozen during training, making it more simple, but learning discriminate features. The metrics that are used to measure model performance are accuracy, precision, recall, F1-score, and confusion matrix analysis. The experimental outcomes prove that the suggested method is characterized by the test accuracy of 97.92, and the performance remains high in all the disease groups, which shows high generalization. Moreover, the visualization of attention based on attention is used to emphasize those lung regions which make the biggest contribution to the classification decision, which increases model transparency and clinical interpretability. Flask is also used to create a web-based application that allows real-time prediction of disease and proves that it is applicable to practice. It is confirmed that the Vision Transformer architectures with explainable attention mechanisms can be used as an effective and reliable solution to automated multi-class lung disease classification and as a helpful clinical decision support tool.

KEYWORD: Vision Transformer, Lung Disease Classification, Medical Image Analysis, Deep Learning, Explainable Artificial Intelligence, X-ray Imaging, Transfer Learning, Clinical Decision Support System.

DATA PREPROCESSING AND FEATURE ENGINEERING FOR MENTAL HEALTH SENTIMENT CLASSIFICATION USING TF-IDF AND VADER INTEGRATION

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ABSTRACT: Monitoring mental health signals in text requires carefully designed preprocessing and feature-engineering workflows. This study proposes a structured pipeline for preparing social media text and deriving informative representations to support sentiment classification related to psychological well-being. Using the Go Emotions corpus (54,262 entries), we apply a multistage preprocessing sequence that includes noise filtering, tokenization, and normalization. Feature construction integrates Term Frequency–Inverse Document Frequency (TF-IDF) vectors with indicators derived from the Valence Aware Dictionary and sEntiment Reasoner (VADER), producing a combined 504-feature representation. When paired with gradient-boosting classifiers, the proposed approach yields a macro-F1 score of 67.45% (95% CI: 66.2–68.7) on held-out data. Results from ablation analyses show that TF-IDF and VADER contribute complementary information. Overall, the pipeline offers an efficient and accurate strategy for mental-health-focused sentiment analysis, well suited to contexts with limited computational resources.

KEYWORDS: Mental health monitoring, natural language processing, data preprocessing, feature engineering, TF-IDF, VADER, sentiment analysis.

THYROID DISEASE PREDICTION AND RISK ASSESSMENT USING MACHINE LEARNING

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ABSTRACT: Thyroid disorders are among the most prevalent endocrine diseases worldwide and often remain undiagnosed due to delayed clinical evaluation and limited access to specialist care. This paper presents a machine learning–based intelligent framework for early thyroid disease prediction and risk assessment using routine clinical and laboratory parameters. The proposed system analyzes structured patient data, including demographic attributes and biochemical markers such as TSH, T3, TT4, T4U, FTI, and TBG, to perform binary classification of thyroid and non-thyroid cases. A robust preprocessing pipeline involving missing-value handling, categorical encoding, normalization, and feature selection is implemented to enhance predictive performance and reduce dimensional complexity. Multiple supervised learning algorithms are trained and comparatively evaluated, with ensemble methods such as Random Forest demonstrating improved prediction stability and generalization capability. The optimized model is deployed within a Flask-based web architecture to enable real-time inference and automated risk scoring. The system generates interpretable outputs consisting of disease prediction, probability-based risk categorization, and AI-driven clinical recommendations for early medical consultation. Experimental evaluation demonstrates reliable predictive capability and improved response time compared to conventional diagnostic approaches. The proposed framework serves as a scalable, cost-effective clinical decision-support tool that enhances early detection and improves healthcare accessibility in resource-constrained environments.

KEYWORDS: Thyroid Disease Prediction, Machine Learning, Random Forest, Risk Assessment, Clinical Decision Support, Healthcare Analytics.

INTELLIGENT BLOOD AND ORGAN DONATION MANAGEMENT PLATFORM

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ABSTRACT: The Intelligent Blood and Organ Donation Management Platform is a web-based healthcare management system aimed at improving the efficiency, transparency, and reliability of blood and organ donation processes. Traditional blood bank operations frequently depend on manual recordkeeping and disjointed communication methods, which can result in delayed notifications to donors, suboptimal utilization of blood stocks, restricted tracking of donor eligibility, and a lack of real-time availability information for patients. These shortcomings can significantly impact emergency healthcare services and the coordination of transplants. The proposed system tackles these issues through a role-based, scalable web application created with React for the frontend and Node.js for the backend. This platform consolidates blood donor management, organ donor registration, inventory tracking, and patient request processing into a cohesive digital environment. It accommodates four main user roles: administrator, blood donor, patient, and organ donor. The administrator is responsible for overseeing donor records, monitoring blood stock levels, managing patient requests, and facilitating approval workflows. Blood donors can securely manage their profiles, track their donation history, confirm their eligibility status, and receive automated notifications for future donations. Patients have the ability to search for specific blood types, verify real-time availability, and submit blood requests online. Additionally, a dedicated Organ Donation Module separately manages organ donor registrations and transplant requests to ensure the organized handling of sensitive medical information. The system integrates automated email alerts, organized approval processes, and instantaneous database updates to enhance collaboration among stakeholders. By reducing manual involvement and streamlining resource distribution, the platform boosts operational efficiency and accessibility for hospitals, blood banks, and healthcare institutions. The suggested architecture illustrates how contemporary web technologies can be effectively employed to create a secure, scalable, and intelligent healthcare support system for managing both blood and organ donations.

KEYWORDS: Intelligent Blood Donation System, Organ Donation Management, Healthcare Information System, Web-Based Application, Role-Based Access Control (RBAC), Blood Inventory Tracking, Automated Email Notification, React.js, Node.js, Healthcare Data Management.

A STUDY TO UNDERSTAND SENTIMENT AND EMOTION THROUGH TEXT-EMOJI PREPROCESSING WITH NLP TECHNIQUES

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ABSTRACT: The remark of Internet forums has a great impact in communication by the AI models including NLP and LLM. The social network is allowed by these and it notes, categorizes and make changes in the information successfully and boosting the user's interaction. In order to abstract the valuable data preprocessing is necessary text data and emojis. Identifying and translating multilingual messages into a single language which increases the usefulness of the data by promoting consistency and comparability across different kinds of linguistic sources. The goal is to detect sentiment polarity (positive, negative, or neutral) and evaluating the subjective and emotional levels independently for both text and emojis. This framework makes use of Python based resources, including the emoji library to decode emoji characters into descriptive tokens and to normalize the content, language normalization techniques are used. WordNet-based lemmatization, tokenization, and stop word removal are some of the components of the Natural Language Toolkit (NLTK) that provide improvements. The study suggests that it improves sentiment and emotion level identification accurately by incorporating these preprocessing processes, especially for short, casual, emoji-rich social media comments.

KEYWORDS: *text preprocessing, emoji decoding, polarity, subjectivity, emotion level detection, NLTK*

SMART INVENTORY AND BILLING SYSTEM FOR RETAIL SHOP MANAGEMENT

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ABSTRACT: This project is tilted as "Smart Inventory & Billing System for Shops" this is develop using HTML, CSS as frontend tool, PHP as backend and MYSQL as database. The Smart Inventory & Billing System for Shops is a web-based application designed to automate and streamline inventory management and billing operations for small and medium-scale retail shops. Traditional manual methods of maintaining stock records and preparing bills are time-consuming, error-prone, and difficult to manage. This system provides a centralized solution to handle product details, stock levels, and sales transactions efficiently. The application enables administrators to manage products and continuously monitor inventory levels in real time. Bills are generated automatically during sales transactions, ensuring accurate calculations and faster checkout processes. A low- stock alert feature helps shop owners identify products that require restocking, thereby preventing shortages and improving inventory planning. The system also produces detailed sales and stock reports that support better business analysis and decision-making. These reports can be exported for documentation and future reference. By improving accuracy, reducing manual effort, and enhancing overall operational efficiency, the Smart Inventory & Billing System offers a reliable and practical solution for modern shop management and academic project implementation.

KEYWORDS: Smart Inventory System, Automated Billing, Retail Management, Stock Management, Sales.

DCC-PERT AND DCC-CPM: A DOMINATING CO-COLOURING FRAMEWORK WITH RDCC REFINEMENT FOR STABILITY-AWARE PROJECT SCHEDULING

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ABSTRACT: Project scheduling is central to engineering management, infrastructure planning, and industrial optimization and also the backbone of planning and control in engineering systems. It has long been used for estimating project duration and identifying critical activities. Despite their widespread use, these classical models treat activities largely in isolation and do not incorporate structural interactions that naturally arise in real project networks. In practice, certain activities exert greater influence over others, while some sets of tasks can be executed concurrently without conflict. This paper develops a new framework that embeds these structural characteristics into scheduling models through a Dominating Co-Colouring Criticality Index (DCCI).
The proposed approach introduces two complementary structures: dominating sets to represent control influence within the activity network, and co-colouring partitions to capture compatibility among activities. These are integrated into both probabilistic and deterministic scheduling models, leading to DCC-PERT and DCC-CPM formulations. DCC-PERT and DCC-CPM models are designed to produce schedules that remain stable and reliable under uncertainty, structural dependency, and activity interaction effects. To address the tendency of structurally weighted models to overestimate durations in dense networks, a refined version called RDCC is introduced with a damping mechanism that regulates duration expansion. Theoretical analysis establishes six key properties of the framework, including existence of structural partitions, bounded duration inflation, convergence of iterative refinement, perturbation stability, resilience to network changes, and bounded sensitivity with respect to structural parameters.
Numerical illustrations and an industrial case study demonstrate that the RDCC models achieve more stable critical paths and more realistic completion times compared with classical PERT and CPM. The framework provides a practical and scalable tool for scheduling in complex systems such as infrastructure development, manufacturing, and large-scale engineering projects.

KEYWORDS: *Dominating Co-Coloring, Critical Path Analysis, Project Scheduling, Dominating Set, Co-Coloring Partition, Robust Optimization, Network Centrality, DCCI Ind*

WIRELESS SENSOR NETWORK MEDICAL IMAGE DETECTION IN ENERGY INTENSIVE COMPUTATION TECHNIQUE USING ANOMALY DETECTION METHOD FOR QUANTUM MACHINE LEARNING ALGORITHM

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ABSTRACT: Wireless sensor networks (WSNs) can be used in a wide range of applications. Many WSN applications demand real-time medical images, with sensed data transmitted to the sink node within a preset deadline set by the application. In WSNs, the sensor nodes' finite resources (e.g., memory and power) and lossy wireless connectivity make it difficult to support real-time applications. Furthermore, many WSN routing algorithms prioritize energy efficiency over delay. Thus, WSNs urgently require new routing protocols that are dependable, energy-efficient, and suitable for real-time applications. It accomplishes this by determining which candidate neighbors are qualified to participate in the routing process and can deliver the packet by the deadline. To reduce the latency of the chosen paths, it calculates the relaying speed for each qualified candidate. Furthermore, it takes into account the selected relays' link quality, hop count, and available buffer capacity, resulting in a reduction in end-to-end delay while minimizing energy usage. Quantum anomaly detection in medical imaging uses quantum machine learning (QML) and quantum mechanics principles to identify, with superior accuracy and speed, deviations from normal network traffic or data patterns. By utilizing techniques like quantum auto encoders, quantum enhanced secure frameworks. By addressing these energy problems, we hope to establish a compromise between anomaly detection models' efficacy and sustainability, guaranteeing that these technologies can be used effectively in real-world healthcare settings. The study continues by emphasizing the need of optimizing computing resources to ensure the effectiveness of medical imaging applications while lowering environmental impact and operating expenses. The proposed method employs EIC techniques and an anomaly detection method for a quantum machine learning algorithm. Consider constructing a system to identify heart arrhythmias now that you are an expert. By building a machine learning model on thousands of EKG readings, you may detect abnormal heartbeats early and alert clinicians to potential concerns, such as heart attack. This type of detection can save lives by issuing early warnings. Building a real-time model entails streaming data from wearable devices and utilizing edge computing to efficiently process data.

KEYWORDS: Energy Intensive computations, Health care, Wireless sensor Network, Anomaly Detection, Quantum machine Learning algorithms.

AN INTELLIGENT DEEP LEARNING FRAMEWORK FOR AUTOMATED SKIN DISEASE DETECTION AND HERBAL RECOMMENDATION

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ABSTRACT: Skin diseases constitute a major global health burden, where delayed diagnosis can lead to severe complications. This work proposes a deep learning–based framework for automated multi-class skin disease detection with integrated herbal recommendation for preliminary care. A Convolutional Neural Network (CNN) is employed to learn discriminative dermal features, including texture, chromatic distribution, lesion morphology, and boundary irregularity, enabling robust classification of melanoma, dermatitis, keratosis, fungal infections, and vascular lesions. The model leverages multi-attribute feature learning to enhance inter-class separability and generalization across diverse image conditions. The predicted disease class is mapped to a knowledge-driven herbal recommendation module that supports early-stage management and preventive awareness. Experimental results indicate improved classification performance and system reliability compared with conventional single-attribute approaches. The proposed framework provides an explainable, scalable, and cost-effective intelligent healthcare assistant that minimizes unnecessary clinical visits and improves accessibility in resource-constrained environments

KEYWORDS: Skin Disease Detection, Deep Learning, Convolutional Neural Network, Multi-Attribute Learning, Herbal Recommendation, Medical Image Analysis.

DEVELOPMENT OF AN AI-DRIVEN RECEIPT MANAGEMENT SYSTEM USING MULTIMODAL LARGE LANGUAGE MODELS.

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ABSTRACT: AI- driven expense management system In today's fast growing digital world, tracking expenses manually is tough and time-consuming task which may often leads to financial disorganization. This project introduces an intelligent, mobile first solution designed to eliminate the manual data maintenance. Implementing multimodal AI helps in extracting important information from receipt. This aims in reducing manual efforts and improve accuracy in expense tracking.

The system features a React Native mobile application supported by unique dual-backend system. When you upload a picture of the receipt, a Fast API layer sends the image to the Google Gemini API. This helps in extracting key details such as merchant name, date, expense, etc. and converting them into a JSON format. To maintain high performance and modularity, a secondary Node.js Express API serves as the dedicated data access layer, retrieving these records for the user to view instantly.

The results confirm that using Large Language Models (LLMs) allows the system to adapt to diverse receipt layouts without the requirement for expensive, custom-trained machine learning models. While this proof-of-concept currently utilizes file-based storage, it successfully demonstrates that AI can cover the gap between physical documentation and digital financial clarity. Future improvements will focus on integrating robust databases and cloud deployment to further enhance scalability and security. Ultimately, this project provides a practical, high-efficiency path toward effortless personal and business expense management.

KEYWORDS: AI powered Automation, Multimodal LLMs (Google Gemini), React Native, Dual backend architecture (FastAPI & Node.js), Automated Data Extraction

ENHANCED SPEECH TO SIGN LANGUAGE TRANSLATION SYSTEM USING 3D ANIMATED AVATARS

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ABSTRACT: Communication is a basic need in everyday life, yet many hearing-impaired individuals struggle to interact with people who do not understand sign language. In schools, workplaces, and public spaces, this communication gap often leads to misunderstanding and social isolation. Therefore, managing speech-to-sign language translation in a simple and accessible way is important to promote inclusivity. Earlier studies mainly concentrated on image-based sign recognition and deep learning techniques. While these systems achieved good accuracy, they required complex hardware setups, controlled environments, and large datasets, making them less suitable for daily real-time communication through mobile devices. The proposed system, Hear Sign, is a mobile application that converts speech into text using a speech-totext API and maps it to corresponding animated sign language Avatar. The application follows a Client–Server Architecture with a Layered Architecture Model, consisting of Presentation Layer (Flutter UI), Application Layer (Speech Processing and Mapping Engine), and Data Layer (Firebase Authentication and Real-time Database) to ensure secure and efficient processing. The UI/UX is developed using a User-Centered Design (UCD) model, focusing on simplicity, clarity, and ease of use. Features include secure login and registration, one-touch microphone activation, real-time gesture display, and smooth navigation. The application delivers fast and reliable real-time translation. The results show improved accessibility and usability, successfully providing a portable and cost-effective assistive communication solution.

KEYWORDS: Speech-to-Sign, 3D Avatar, Sign Language Translation, Flutter, Firebase, Accessibility, Real-Time Communication.

ECO-TECH INNOVATION: A NEW ERA OF E-WASTE MANAGEMENT

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ABSTRACT: **I**mproper disposal of electronic waste has become a major environmental concern worldwide. Many individuals discard electronic devices such as mobile phones, laptops, televisions, and batteries without following proper disposal methods. These devices contain hazardous substances including lead, mercury, and cadmium. When released into the environment, these toxic materials contaminate soil, water, and air, posing serious risks to human health and ecosystems. Therefore, effective e-waste management is essential to reduce pollution, conserve natural resources, and support sustainable development. Recycling electronic waste also promotes the reuse of valuable materials and reduces the burden on landfills. Existing e-waste management systems primarily focus on spreading awareness or providing basic information about recycling centers. However, many of these solutions lack structured guidance, interactive support, and integrated technological features that assist users throughout the disposal process. To address these limitations, this project proposes a mobile application designed to facilitate responsible e-waste disposal through a comprehensive and user-focused approach. 'The application is developed using an Eco-Interactive Smart Architecture (EISA), which includes presentation, business logic, and database layers to ensure systematic organization and efficient performance. It integrates QR and barcode scanning to identify electronic items and utilizes GPS functionality to provide information about authorized collection centers. Additionally, push notifications educate and remind users about safe disposal practices. The interface is designed using a User-Centered Design methodology to enhance usability and engagement. System implementation and testing confirm stable performance, accurate functionality, and effective user support for responsible e-waste management.

KEYWORDS: E-Waste Management, Eco-Interactive Smart Architecture (EISA), Mobile Application, GPS Navigation, Sustainable Development, Recycling Systems.

AN AI-DRIVEN REAL-TIME PHISHING DETECTION SYSTEM

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ABSTRACT: Phishing attacks continue to pose a significant cyber security threat by exploiting users through malicious URLs, deceptive emails, and fraudulent web interfaces. Conventional protection mechanisms primarily depend on static blacklists and rule-based filtering, which are inadequate in detecting zero-day attacks, dynamically generated domains, and context-aware social engineering techniques. To address these limitations, this project proposes an AI-Driven Real-Time Phishing Detection System designed to dynamically analyze suspicious URLs and textual inputs using intelligent feature evaluation methods. The system performs lexical URL feature extraction, domain characteristic analysis, HTTPS security validation, and contextual linguistic assessment to classify content as Safe, Suspicious, or Phishing with an explainable confidence score. The architecture integrates a React-based frontend, a secure cloud backend with protected API endpoints, and Sup abase PostgreSQL for scalable data management and storage. Furthermore, a Chrome browser extension enables real-time website scanning during live browsing sessions, delivering immediate alerts, highlighted risk indicators, and recommended preventive actions. Performance evaluation demonstrates consistent detection reliability with average response times of approximately 2–3 seconds per scan under concurrent usage conditions. The proposed solution provides a scalable, cloud-deployed, and user-centric cyber security framework that enhances digital trust and strengthens defense against evolving phishing threats.

KEYWORDS: Phishing Detection, URL Feature Extraction, Cyber security, Machine Learning, Real-Time Threat Analysis, Explainable AI, Cloud-Based Security, Browser Extension

ABSTRACT
Deep fake detection and Social media Safety.
With the rise of generative Al, deepfake content poses significant threats to social media safety and information integrity. This project develops a robust deepfake detection system using convolutional neural networks to analyze video and audio artifacts. The system identifies inconsistencies in facial movements and voice patterns indicative of manipulation. By integrating this tool into social media platforms, we aim to flag synthetic content before it spreads misinformation. The methodology involves training on diverse datasets of real and fake media. Results show high detection rates, enhancing user trust. This solution safeguards public discourse, prevents fraud, and protects individuals from reputational damage, ensuring a safer digital environment against malicious synthetic media proliferation.

HYPERWEB AI: A NATURAL LANGUAGE PROCESSING-BASED AI-POWERED WEB CODE GENERATOR

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ABSTRACT—This paper offers HyperWeb AI, a full-stack web application which uses artificial intelligence to turn natural language descriptions into web code that is ready for production via the Lovable AI Gateway, the system combines a Supa base serverless backend and a React-TypeScript frontend with Google Gemini 2.5 Flash. The application includes a Monaco-centered code editor, real-time preview capabilities, responsive device simulation, and version history management. By highlighting the real-world application of Large Language Model (LLM) integration for code generation tasks, this study addresses issues regarding prompt engineering, structured output parsing, and user experience design. Experimental results show that the system successfully produces semantically correct HTML, CSS, and JavaScript code from natural language inputs with an average response time of less than three seconds.

KEYWORDS— Artificial Intelligence, Natural Language Processing, Web Development, Code Generation, React, TypeScript, Serverless Architecture, and Large Language Models

AI BASED SIGNATURE VERIFICATION SYSTEM

ABSTRACT : The AI Based Signature Verification System is an intelligent application designed to automatically verify the authenticity of handwritten signatures using Artificial Intelligence and Machine Learning techniques. Signature verification plays a vital role in banking, legal documentation, and authentication systems where manual verification is time-consuming and prone to human errors. This project aims to develop an automated system that compares a given signature with pre-stored genuine signatures and determines whether it is authentic or forged. The proposed system uses image processing and pattern recognition techniques to extract important features from signature images. Machine learning algorithms are applied to analyze and classify signatures based on their structural and behavioral characteristics. The system is trained using a dataset of genuine and forged signatures to improve accuracy and reliability. Technologies such as Python, OpenCV, and deep learning models are utilized for implementation. This AI-powered solution ensures fast, accurate, and secure verification, reducing fraud and improving efficiency in authentication processes. The system can be further integrated with real-world applications such as banking systems, attendance systems, and digital document verification platforms

REAL-TIME FAKE JOB POST IDENTIFIER

ABSTRACT: The rapid growth of online recruitment platforms has increased opportunities for job seekers but has also led to a significant rise in fraudulent job postings. A Real-Time Fake Job Post Identifier is an Artificial Intelligence-based system designed to detect and prevent job scams by analyzing job descriptions, recruiter details, and posting patterns. The system utilizes Machine Learning algorithms such as Logistic Regression, Random Forest, and Support Vector Machines to classify job posts as genuine or fraudulent. By extracting textual features using Natural Language Processing (NLP) techniques like TF-IDF and word embeddings, the model identifies suspicious patterns such as unrealistic salary offers, vague company information, and urgent hiring language. The system operates in real-time, enabling immediate detection when a job post is submitted or viewed on a platform. This solution enhances user safety, improves trust in online recruitment systems, and reduces financial and personal risks associated with job scams. The proposed system can be integrated into job portals and social media platforms to automatically flag or remove suspicious job listings.

KEYWORDS: • Artificial Intelligence (AI) • Machine Learning (ML) • Fake Job Detection • Online Recruitment Fraud • Natural Language Processing (NLP) • Text Classification • Real-Time Monitoring • Cybersecurit

LOCATION BASED REMAINDER APPLICATION USING GEOFENCING

ABSTRACT : In today's fast-paced and highly mobile lifestyle, individuals often forget important tasks due to busy schedules and dynamic movement between locations. Traditional reminder systems are primarily time-based and may trigger alerts at inappropriate or inconvenient moments. To overcome this limitation, this project proposes an Android-based Location Based Reminder Application that delivers intelligent alerts based on the user's geographical position. The core objective of this project is to implement geofencing technology to detect when a user enters a predefined geographic area and automatically trigger relevant reminders. The system leverages GPS and Google Maps API to monitor location boundaries efficiently while optimizing battery consumption. Reminder data, including task details, location coordinates, and radius settings, is stored locally using SQLite to ensure offline functionality and reliable performance even without continuous internet connectivity.

The application is designed and developed using Android Studio and Java, integrating Android SDK components for background location tracking and notification management. The system architecture ensures accurate detection, efficient data handling, and smooth user interaction. By introducing context-aware alerting, the proposed system enhances task management, reduces missed activities, and improves overall productivity. Ultimately, this project demonstrates the effectiveness of location-aware computing in everyday applications and provides a scalable framework that can be extended with cloud synchronization, intelligent reminder suggestions, and cross-device integration in future developments.

The system continuously monitors the user's location in the background using optimized location services to minimize battery consumption. Geofence boundaries are defined using latitude, longitude, and customizable radius parameters for accurate detection. Push notifications are generated instantly when the user enters the specified location zone. The application ensures secure local data handling and efficient database management. The user interface is designed to be simple, interactive, and easy to configure for all types of users. This solution enhances real-time task management by combining mobility, automation, and intelligent location tracking.

KEYWORDS

Location-Based Reminder, Geofencing, GPS, Android Application, Google Maps API, SQLite Database, Location-Aware System, Mobile Computing, Context-Aware Alerting, Android SDK.

AI- SCRABBLE GAME USING NLP-BASED WORD PREDICTION AND DIFFICULTY ADJUSTMENT ALGORITHMS

ABSTRACT : The traditional Scrabble game challenges players to form meaningful words using randomly assigned tiles, but many beginners struggle with vocabulary limitations and difficulty progression. To address these challenges, this project proposes an AI- Scrabble game that integrates Natural Language Processing (NLP) based word prediction and dynamic difficulty adjustment algorithms to enhance gameplay, learning, and engagement.

The system uses NLP techniques and a trained language model to analyze available letter tiles and predict valid high-scoring word suggestions, helping players learn new vocabulary and improve word-formation skills. Additionally, the difficulty adjustment engine monitors player performance, game history, and word accuracy to automatically modify the complexity level by adjusting tile distribution, scoring system, and suggestion frequency. This adaptive mechanism ensures that both beginners and advanced users experience a balanced and motivating gameplay environment.

The proposed system enhances traditional Scrabble by combining educational value with AI-driven gameplay support. It promotes vocabulary building, strategic thinking, and personalized learning through intelligent recommendations and adaptive difficulty. The application can be deployed for educational language learning, competitive gameplay, or entertainment, benefiting students, ESL learners, and casual players.

A COMPUTATIONAL INTELLIGENCE-DRIVEN DIGITAL TWIN FRAMEWORK FOR INTELLIGENT SIMULATION AND SYSTEM ANALYSIS

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ABSTRACT The increasing complexity and dynamic nature of real-world systems demand intelligent frameworks capable of analyzing system behavior under uncertainty without relying on real-world experimentation. Traditional static models often fail to adapt to changing conditions, leading to inefficiencies, risks, and poor system understanding. To address this challenge, this paper proposes a Computational Intelligence–Driven Digital Twin Framework for Intelligent Simulation and System Analysis. The proposed framework constructs a virtual replica of a real-world system, referred to as a digital twin, and enhances it with computational intelligence techniques to enable adaptive learning, simulation, and analysis. The system accepts simulated input parameters, models system behavior through a digital twin engine, and applies computational intelligence logic to evaluate multiple scenarios. This enables prediction of future system behavior, risk assessment, behavior analysis, sustainability evaluation, scenario testing, and training simulations within a single unified framework. The framework is implemented using simulation-based modeling and adaptive computational intelligence techniques, producing structured tabular outputs that allow comparison of different scenarios and system states. The proposed approach provides a safe, flexible, and scalable environment for understanding complex system dynamics without affecting real-world operations. The results demonstrate that the proposed framework effectively supports intelligent system analysis and offers significant potential for applications in smart systems, infrastructure planning, healthcare, and other complex domains. This work highlights the role of computational intelligence–driven digital twins as a powerful tool for system simulation, analysis, and futureready

EMOTION-AWARE LEARNING AGENT FOR PERSONALIZED EDUCATION

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ABSTRACT: Personalized learning has gained significant attention in contemporary education, particularly with the rapid expansion of digital and online learning platforms. Conventional e-learning systems typically deliver uniform content and rarely account for learners' emotional conditions, even though emotions strongly influence comprehension, motivation, and academic success.This study introduces an Emotion-Aware Learning Agent that leverages Artificial Intelligence (AI) to monitor and interpret students' emotional states in real time. The proposed system combines facial expression recognition, voice modulation analysis, and behavioral interaction data to detect emotions such as confusion, frustration, boredom, and engagement.

Based on the identified emotional cues, the intelligent agent dynamically modifies instructional materials, adjusts content complexity, and personalizes feedback strategies to support improved understanding and sustained motivation. Machine learning techniques are applied to classify emotional patterns and generate adaptive learning recommendations tailored to individual students.

Experimental findings demonstrate that integrating emotional intelligence into learning systems significantly enhances student engagement, knowledge retention, and overall academic performance when compared to conventional static e-learning environments.The research emphasizes the importance of incorporating affective computing principles into educational technologies to develop adaptive, intelligent, and learner-centered educational systems.

KEYWORDS: Emotion-Aware Learning Agent; Artificial Intelligence; Affective Computing; Personalized Learning;

ARTIFICIAL INTELLIGENCE-BASED PREDICTIVE ANALYTICS FOR SUSTAINABLE SMART SYSTEMS

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ABSTRACT: Artificial Intelligence (AI) powered predictive analytics is transforming smart environments by enabling intelligent decision-making through real-time data analysis and forecasting. This paper explores how advanced machine learning algorithms, data mining techniques, and IoT sensor data are integrated to predict patterns, optimize resource utilization, and enhance system efficiency in smart cities, smart homes, healthcare, transportation, and energy management systems. By analyzing historical and real-time data, AI models can forecast energy consumption, traffic congestion, equipment failures, environmental changes, and user behavior with high accuracy.

The study highlights key technologies such as deep learning, neural networks, big data analytics, and cloud computing that drive predictive intelligence in smart systems. It also discusses challenges including data privacy, security risks, scalability issues, and ethical considerations. The paper concludes that AI-powered predictive analytics plays a crucial role in building sustainable, efficient, and adaptive smart environments, ultimately improving quality of life and supporting future digital transformation initiatives.

KEYWORDS: Artificial Intelligence; Predictive Analytics; Smart Environments; Machine Learning; Internet of Things (IoT);

THE IMPACT OF SOCIAL MEDIA ON CRIME: A COMPREHENSIVE INVESTIGATION

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ABSTRACT: This study analyses the complex relationship between crime and social media, looking at the various ways that these platforms affect criminal behaviour, investigations, and public opinion. It starts out by outlining the changing nature of crime and its fundamental component, highlighting how technological developments have transformed the conventional understanding of criminality. The study also examines how social media affects public opinion and unlawful reporting. It also looks at how social media affects the legal system, particularly how it affects criminal investigations, court cases, and activism.

The study extends its attention to include the impact of social media on young people, emphasising how young people's exposure to harmful content and the influence of social media influencers can result in criminal behaviour. In the end, this study offers insightful facts regarding the complicated connection between social media and criminality, highlighting the necessity of all-encompassing approaches to deal with the problem that digital platforms provide to modern society.
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KEYWORDS: Crime, Social media, Cybercrime, Influential Crime, Internet

A SMART CRYPTO-BIOMETRIC METHOD FOR SECURING CLOUD DATA

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ABSTRACT: Cloud computing is the most important platform and majorly it is known for its scalability, storage of data and processing the data. Biometric information is a sensitive part and due to the risks like data loss or data spill (also known as data leakage) , unauthorized access , identity fraud , securing the biometric information in cloud platforms have become a major hurdle. In traditional biometric systems, raw biometric templates were stored on cloud servers where there were many security issues, and flaws. The major biometric identifiers are fingerprints, iris patterns, facial features which are unique in every single person. Once the biometric profile they cannot be changed. As a result biometric data is treated as confidential information. Powerful protection techniques like encryption, safe storage, authentication methods which preserves privacy are important to prevent the access to unauthorized people and incorrect usage of biometric information. Here we use a secure crypto-biometric authentication which is used for preserving the biometric verification in the cloud based applications. This workflow is divided into 4 phases. The first phase is feature extraction where all the important features are extracted from the biometric pictures to recognize all the distinct characteristics of every use. The second phase is PCA (which is also known as principal component analysis) where the size of the data is reduced by removing all the unwanted information. This make the system to work fast and more efficiently. The third phase is GMM (which is also known as Gaussian mixture model) where the users are recognized and categorized based upon their biometric features. In final phase a combination of AES and ECC techniques are used. These are the encryption techniques where the biometric data is safely stored and protected during the storage and verification.

KEYWORDS: Cloud computing, Biometric information ,Biometric identifiers, Data leakage, Biometric templates Unauthorized access, Confidential information, Authentication , Feature extraction, Principal component analysis, Dimensional reduction, Gaussian mixture model, AES, ECC, Verification, Cloud based applications, Fingerprint , Iris patterns, Facial features.

A SYSTEMATIC SURVEY OF HYPERVISOR SECURITY FLAWS AND EXPLOITATION RISKS IN VIRTUALIZED CLOUD PLATFORMS

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ABSTRACT— The hypervisor serves as the foundational control layer in cloud virtualization, enabling multiple tenants to share physical resources while maintaining logical isolation between virtual machines. This critical role has made it an increasingly attractive target for attackers. This paper presents a review of hypervisor-level vulnerabilities within cloud environments, focusing on threats such as virtual machine escape, privilege escalation, side-channel leakage, co-residency attacks, and exploits arising from misconfigurations. The complexity of abstraction layers and the sharing of hardware resources broaden the hypervisor's attack surface, leaving it exposed to microarchitectural threats and zero-day exploits. While various mitigation strategies including hypervisor hardening, the design of minimal trusted computing bases, hardware-assisted virtualization, runtime monitoring, and adap-tive intrusion detection frameworks have strengthened resilience, significant risks remain. Emerging paradigms such as confidential computing and enclave-based architectures help reduce data exposure but continue to depend on assumptions about hypervisor integrity. Key open challenges include the development of formally verified hypervisors, dynamic vulnerability detection, secure multi-tenant scheduling, AI-driven threat prediction, and lightweight isolation mechanisms tailored for cloudnative workloads. Strengthening hypervisor security remains essential for building trustworthy, private, and resilient nextgeneration cloud infrastructures.

KEYWORDS—Cloud computing, Hypervisor, Vulnerabilities, Virtualization.

AI-BASED FAKE NEWS DETECTION USING MACHINE LEARNING COMPUTATIONAL INTELLIGENCE

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ABSTRACT: The rapid growth of social media platforms such as Facebook, Twitter, and WhatsApp has significantly increased the spread of fake news, which can mislead the public and create social, political, and economic instability. Detecting fake news manually is time-consuming and inefficient due to the large volume of online content. This project proposes an Al-based fake news detection system using Machine Learning techniques to automatically classify news articles as real or fake. The system uses Natural Language Processing (NLP) methods for text preprocessing, including tokenization, stop-word removal, and feature extraction techniques such as TF-IDF. Various supervised machine learning algorithms such as Logistic Regression, Naïve Bayes, and Support Vector Machine (SVM) are applied to train the model on labeled datasets. The performance of the model is evaluated using accuracy, precision, recall, and F1-score metrics. The proposed system aims to provide a reliable and efficient solution for identifying misleading information online. By leveraging Artificial Intelligence and Machine Learning, this project contributes to reducing the impact of misinformation and promoting trustworthy digital communication. Overall, AI-based fake news detection using machine learning plays a crucial role in combating misinformation and ensuring the integrity of digital information ecosystems. Future enhancements may include incorporating multimodal data such as images and videos, real-time streaming analysis, and hybrid deep learning architectures to further improve detection accuracy and robustness.

FRACTURE VISION: AN AI-POWERED BONE FRACTURE DETECTION SYSTEM USING YOLOV8 FOR TARGETED SKELETAL DIAGNOSIS

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ABSTRACT : Accurate detection of bone fractures from X-ray images is essential for timely orthopedic diagnosis; however, manual interpretation remains challenging due to low contrast, subtle fracture patterns, and high patient volume in emergency settings. Existing automated systems often focus solely on classification without precise localization or clinical interpretability. This paper presents Fracture Vision, an explainable Artificial Intelligence-based framework for automated fracture detection and severity analysis in upper-limb radiographs. The proposed system integrates Contrast Limited Adaptive Histogram Equalization (CLAHE) for image enhancement, YOLOv8 for region-of-interest localization, and a Convolutional Neural Network-based classifier for fracture identification and severity categorization. To enhance transparency and clinical trust, Grad-CAM++ is incorporated to generate heatmaps highlighting fracture-relevant regions influencing model predictions. The modular architecture separates detection and classification tasks, improving robustness and scalability across multiple skeletal regions including wrist, hand, elbow, shoulder, humerus, finger, and tibia. Experimental evaluation demonstrates strong detection performance and reliable severity prediction, indicating the effectiveness of the integrated approach. The framework is further implemented through a lightweight web-based interface to support real-time diagnostic assistance. Fracture Vision contributes a structured, interpretable, and deployable AI-driven solution for enhanced orthopedic imaging analysis.

KEYWORDS: Bone Fracture Detection, YOLOv8, Medical Image Analysis, Explainable AI, Grad-CAM++, Deep Learning.

ZERO TRUST SECURITY MODEL FOR ENTERPRISE NETWORKS

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ABSTRACT: The Zero Trust Security Model changes how organizations protect digital assets by rejecting the idea that anything inside the corporate network is automatically safe. It requires ongoing verification of every user, device, and application before granting access to resources. This paper provides a practical overview of Zero Trust, tailored for enterprise networks. It outlines the model's main concepts: least-privilege access, micro segmentation, continuous authentication, and device posture checks. It describes how these principles work together to reduce lateral movement, limit the impact of breaches, and strengthen defenses for distributed and cloud-focused environments. The abstract also points out key elements such as Identity and Access Management (IAM), Multi-Factor Authentication (MFA), Zero Trust Network Access (ZTNA), and behavioral analytics. It briefly mentions deployment steps like asset discovery, defining the protect surface, policy creation, and monitoring. Finally, the abstract discusses real-world trade-offs: cost, legacy integration, and organizational change. It argues that Zero Trust is a strategic shift, not just a single product. Adopting Zero Trust helps enterprises respond more effectively to modern threats and safeguard data and services across hybrid, cloud, and remote work environments. Index Terms—Zero Trust, Network Security, Access Control, Cyber Defense, Continuous Authentication.

KEYWORDS: Zero Trust Security, Enterprise Network Security, Identity and Access Management (IAM), Continuous Authentication, Micro-Segmentation, Zero Trust Network Access (ZTNA), Cloud and Remote Work Security.

GRAPH ALGORITHMS AND THEIR APPLICATIONS IN NETWORK ANALYSIS

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ABSTRACT: Graph algorithms form the foundation of network analysis and play a crucial role in understanding, modeling, and optimizing complex interconnected systems. With the rapid growth of communication networks, social media platforms, transportation systems, and distributed computing environments, efficient graph-based techniques have become essential for analyzing large-scale data structures. This study presents a comprehensive overview of fundamental graph algorithms, including Breadth-First Search (BFS), Depth-First Search (DFS), Dijkstra's shortest path algorithm, Bellman-Ford algorithm, Floyd-Warshall algorithm, and Minimum Spanning Tree algorithms such as Kruskal's and Prim's. The paper examines how these algorithms are applied in real-world network scenarios to solve problems such as shortest path determination, connectivity analysis, community detection, routing optimization, traffic flow management, and network reliability assessment. Special emphasis is placed on algorithmic efficiency, scalability, and computational complexity, highlighting how appropriate graph representations (adjacency matrix and adjacency list) influence performance and memory utilization. Furthermore, the study discusses the role of graph algorithms in emerging domains such as cybersecurity threat detection, recommendation systems, and cloud network management. By evaluating time and space complexity considerations, the research demonstrates how optimized graph-based approaches enhance decision-making processes and ensure efficient resource management in large and dynamic networks. The findings reinforce the importance of graph algorithms as a core component in designing robust, scalable, and high-performance network systems.

KEYWORDS: Graph algorithms, network analysis, BFS, DFS, shortest path algorithms, minimum spanning tree, Dijkstra's algorithm, connectivity analysis, computational complexity, scalability, optimization, network modeling.

SMART CROWD PERSON IDENTIFICATION SYSTEM USING DEEP LEARNING-BASED FACE RECOGNITION

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ABSTRACT: Identifying a specific individual in crowded surveillance footage is a challenging task due to occlusion, pose variation, illumination changes, and high crowd density. Manual monitoring of CCTV videos is inefficient and prone to human error. This project presents a Smart Crowd Person Identification System that automatically detects and recognizes a target individual from dense crowd video sequences using deep learning techniques. The system utilizes MTCNN for accurate face detection and Face Net to generate discriminative facial embeddings. To improve robustness, multiple query images of the target person captured from different angles are averaged to create a stable reference embedding. Additionally, a temporal confirmation mechanism across consecutive frames is applied to reduce false positives and enhance identification stability. Experimental evaluation demonstrates that the proposed approach achieves reliable accuracy and real-time performance, making it suitable for public surveillance, event monitoring, and forensic investigation applications.

KEYWORDS: Crowd surveillance, Face Recognition, YOLOv8, Face Net, Deep Learning, person identification.

REAL-TIME SIGN LANGUAGE TRANSLATION SYSTEM USING DEEP LEARNING AND COMPUTER VISION

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ABSTRACT : Sign language serves as a primary mode of communication for individuals with hearing and speech impairments; however, communication barriers persist when interacting with people unfamiliar with sign language. To address this challenge, this paper proposes a real-time sign language translation system that integrates computer vision and deep learning techniques to convert hand gestures into readable text and synthesized speech. The system captures live video using a standard webcam and employs the MediaPipe Hands framework to detect and extract 21 three-dimensional hand landmark points, which are structured into a spatial feature vector representing finger articulation and hand orientation. These features are processed using a neural network model implemented with TensorFlow and Keras for multi-class classification of static sign language alphabets, consisting of fully connected layers with ReLU activation and a Softmax output layer that generates probability distributions across 26 alphabet classes. The predicted gesture is displayed as text and converted into audible speech using a text-to-speech module, enabling seamless interaction between hearing-impaired users and non-sign language users. Experimental evaluation on a custom dataset of 7,800 labeled samples achieved an overall classification accuracy of 95.8%, demonstrating robustness under varying lighting and background conditions. The proposed system provides a cost-effective, hardware-independent assistive communication solution and establishes a scalable foundation for future development in continuous gesture recognition and multilingual translation.

KEYWORDS: Index Terms— Sign Language Translation, Hand Gesture Recognition, MediaPipe , Hand Landmark Detection, Text-to-Speech, Assistive Technology.

AGENTIC ARTIFICIAL INTELLIGENCE IN HIGHER EDUCATION: TRANSFORMING ADMINISTRATIVE ECOSYSTEMS THROUGH AUTONOMOUS DECISION SYSTEMS

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ABSTRACT : Modern higher education institutions face growing administrative complexity in scheduling, enrollment management, student services, and campus operations. Traditional manual systems often lack the speed and adaptability required to manage data-intensive processes efficiently. Agentic artificial intelligence (AI) offers a transformative solution by deploying autonomous software agents capable of planning and executing multi-step objectives with minimal human intervention. Unlike conventional automation, agentic AI systems interpret real-time data, make context-sensitive decisions, and act according to institutional policies. In college management, they function as continuous digital administrators, optimizing classroom scheduling, streamlining admissions screening, monitoring student performance to identify at-risk learners, automating attendance and security systems, and improving energy and resource efficiency. They also enhance administrative workflows such as billing, registration, and advising coordination. Early implementations demonstrate significant efficiency gains, enabling faster application processing and reducing staff workload. However, responsible deployment requires strong governance frameworks to ensure transparency, fairness, and accountability. Overall, agentic AI represents an emerging infrastructural shift toward adaptive, data-driven, and student-centered smart campuses.

KEYWORDS: Agentic AI, College Administration, Smart Campus, Scheduling, AI Governance

RENEWABLE ENERGY USAGE IN INDIA USING RANDOM FOREST

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ABSTRACT: India's rapidly increasing energy demand, driven by population growth, urbanization, and industrial expansion, has intensified the need for sustainable and efficient energy management. Renewable energy sources such as solar, wind, hydro, and biomass play a vital role in reducing dependence on fossil fuels, lowering carbon emissions, and supporting long-term energy security. Accurate forecasting of renewable energy usage is therefore essential for effective energy planning, grid stability, and policy formulation. This paper presents a data-driven machine learning framework for predicting renewable energy usage across Indian states using a Random Forest Regression model. The proposed system utilizes historical state-wise energy generation data from multiple renewable sources, combined with demand-related and environmental factors, to estimate total renewable energy consumption in gigawatt-hours (GWh). Comprehensive data pre-processing techniques, including data cleaning, feature engineering, categorical encoding, and feature scaling, are applied to improve data quality and enhance model performance. The predictive capability of the proposed model is evaluated using standard regression metrics such as Mean Absolute Error (MAE), Mean Squared Error (MSE), and R^2 score. Experimental results indicate that the Random Forest model effectively captures non-linear relationships among renewable energy sources and provides reliable and accurate predictions. To facilitate practical deployment and improve accessibility, the trained model is integrated into an interactive Streamlit-based web application that enables users to input state-specific parameters, generate real-time predictions, and visualize insights through feature importance analysis, correlation heatmaps, and actual versus predicted comparisons. The proposed system offers valuable decision-support capabilities for policymakers, energy planners, and researchers by identifying key factors influencing renewable energy usage and highlighting priority areas for investment and development. This study demonstrates the effectiveness of machine learning–based forecasting in renewable energy management and contributes to India's transition toward sustainable, efficient, and environmentally responsible energy systems.

Keywords: Renewable energy forecasting; Machine learning; Randomforest regression; Energy analytics; Sustainable energy systems; India.

ECO-FRIENDLY EDGE AI SYSTEMS USING SOC, FPGA,AND MICROCONTROLLER-BASEDPLATFORMS

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ABSTRACT : Edge AI systems are implemented using these three fundamental platform types: System-on-Chip (SoC), Field-Programmable Gate Array (FPGA), and Microcontroller (MCU). An SoC is a complete computing system on a single piece of silicon. For Edge AI, the most critical component is often an integrated NPU, a specialized accelerator designed from the ground up to efficiently execute the matrix math underpinning neural networks, facilitating the process of running complex AI models (like vision transformers or LLMs) alongside a full operating system and managing peripherals like cameras and displays in the making of smart cities. The real-world example for SOC is Ambrella's N1-655 System-On-Chip, which has the efficiency to execute large language models with up to 8 billion parameters while simultaneously processing 12 video streams with the striking feature of a low-power budget of just 15 watts. This is a prime example of high-performance, power-efficient edge processing. In essence, SoCs offer the best balance of performance and ease of use for complex tasks, FPGAs provide unparalleled flexibility and low latency for custom pipelines, and MCUs enable intelligence at the lowest power and cost points. Since the best choice is the one that best aligns with the dynamic need of every individual project requirement. The technological convergence of the SoC, FPGA, and microcontroller-based platform, which can form the technological confluence, will facilitate the sustainable ubiquitous computing platform.

KEYWORDS: System-on-chip, FPGA, MCU platform, edge AI, ubiquitous computing, multi-sensor platform, and smart cities.

COFFEE BEAN IMAGE QUALITY AND TYPE DETECTION

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ABSTRACT : This project presents the Coffee Bean AI Quality Inspector, an intelligent assessment system designed to automate and standardize the evaluation of green coffee beans using YOLOv8 deep learning architecture. Traditional coffee grading is a labor-intensive, subjective process prone to human error and inconsistency. To address this, the system leverages high-speed computer vision to perform real-time variety detection (Arabica, Robusta, and Liberica) and comprehensive quality assessment. The model is specifically trained to identify critical defects, including fungus damage, insect infestation, black beans, and sour beans.

A key innovation of this system is the integration of an automated Quality Grading System based on international export standards, categorizing batches into Premium, Commercial, or Reject grades. Furthermore, the application introduces a practical intervention logic: it differentiates between minor defects that can be remediated through cleaning and severe infestations that render the beans unusable. Developed for versatility, the system supports both live mobile photography and batch image uploads, generating professional inspection reports with detailed bean statistics and commercial recommendations.

By decentralizing high-accuracy quality control, this tool empowers smallholder farmers and traders to maximize the market value of their crops while ensuring consistent quality for the global supply chain.

Keywords: YOLOv8, Coffee Quality Assessment, Deep Learning, Defect Detection

COMPARATIVE STUDY ON UNSUPERVISED PREPROCESSING TECHNIQUES FOR LEAF IMAGE ANALYSIS

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ABSTRACT: Java Plum plays a prominent role in Ayurveda, Siddha and Unani health systems by its strong medicinal properties. In order to yield healthy fruits in a Java plum tree, it is essential to get early detection of nutrient deficiencies on the leaves which plays a very essential role for their rich growth. For capturing the disorders in the leaves in the premature stage, as a footing step this study mainly focuses on strengthening the leaf image quality in the preprocessing part - an initial stage for reducing the noise level and obtaining a better image output for further stages of analysis in any relevant research. For creating a concrete base on the preprocessing stage, using around 250 leaves three autoencoder architectures such as Residual Convolutional Autoencoder, U-Net Autoencoder, and the Variational Autoencoder, were compared and it proved that the Residual Convolutional Autoencoder is the finest model for acquiring the superior denoised image result by achieving impressive metrics with the values of .6892 in SSIM and 29.82 db in the PSNR. DeepLabV3+ processed the denoised images for semantic segmentation and the segmented outputs were fed into a trained Wavelet Transformer to extract the required features in a .csv file. The Multilayer Perceptron (MLP) classifier with Stochastic Gradient Descent (SGD) resulted features were recorded in a .csv file. This pipeline is attempted for predicting the nutrition disorders in the leaves at the preliminary point.
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KEYWORDS: Residual Convolutional Autoencoder, U-Net Autoencoder, Variational Autoencoder, Wavelet Transformer, Multilayer Perceptron (MLP).

LIGHTWEIGHT REAL-TIME PREDICTIVE MODELING FOR SMART URBAN SYSTEMS

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ABSTRACT Smart urban systems rely on continuous real-time data generated from traffic networks, energy grids, water distribution systems, and environmental monitoring units. Effective utilization of this data is essential for improving urban infrastructure management and public services. However, deploying computationally intensive predictive models in real-time city environments is often limited by hardware constraints, latency requirements, and energy consumption. This paper proposes a lightweight real-time predictive modelling framework designed to support practical smart urban applications. The proposed approach enables traffic congestion prediction for adaptive signal control, electricity demand forecasting to prevent overload and power interruptions, water usage analysis for early leakage detection, and pollution level prediction for timely environmental alerts. Multiple lowcomplexity machine learning algorithms are evaluated to ensure fast response time, efficient resource utilization, and reliable prediction performance. Experimental analysis demonstrates that lightweight models can provide stable and accurate predictions suitable for real-time deployment in urban infrastructure systems. The results highlight the feasibility of cost-effective, scalable, and efficient predictive solutions that enhance operational efficiency, reduce resource waste, and support sustainable smart city development.

KEYWORDS: Lightweight Machine Learning, Real-Time Prediction, Smart Urban Infrastructure, Resource-Efficient AI, Decision Support Systems.

AI-DRIVEN SMART INSURANCE POLICY COMPARATOR & SALES COACH

ABSTRACT The motor insurance industry is highly competitive, with customers often making decisions based solely on the lowest premium rather than coverage quality. For insurance agencies with multiple tie-up partners, manually comparing policies, calculating accurate premiums across different "Discount Grids," and explaining complex policy wordings to customers is time-consuming and prone to human error. This project proposes an "AI-Powered Instant Comparison Generator" designed for Direct Insurance Service. The system integrates a robust backend database (Vehicle Master, RTO, and Discount Grids) with a Generative AI layer (Retrieval-Augmented Generation or RAG) to automate the entire sales advisory process. The solution takes minimal user input (Registration Number, Make/Model) and performs three critical functions: 1. Automated Premium Calculation: Uses real-time discount grids and IRDAI rates to calculate exact premiums for 12+ tie-up companies. 2. Qualitative Comparison: Uses Large Language Models (LLMs) to analyze PDF policy wordings and highlight "hidden" benefits like Claim Settlement Ratios and specialized add-ons. 3. Persuasive Reporting: Generates a formatted "Comparison Quote" (Excel/PDF) that acts as a sales tool, visually demonstrating why a higher-value policy is better than the cheapest option. This system aims to reduce quote generation time from 15 minutes to under 30 seconds while increasing the conversion rate by providing data-backed, unbiased recommendations.

ROLE OF ETHICAL HACKING TECHNIQUES IN SECURITY TESTING

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ABSTRACT: Ethical hacking techniques play a crucial role in security testing by proactively identifying vulnerabilities in computer systems, networks, and applications before they can be exploited by malicious attackers. Ethical hackers, also known as white-hat hackers, use authorized and systematic methods such as reconnaissance, scanning, vulnerability assessment, penetration testing, and controlled exploitation to evaluate the overall security posture of an organization. These techniques help uncover weaknesses related to misconfigurations, insecure coding practices, weak authentication mechanisms, unpatched software, improper access controls, and humanrelated vulnerabilities such as susceptibility to phishing attacks. In addition to technical assessments, ethical hacking also involves social engineering tests, wireless security evaluations, web application testing, and cloud security reviews. Ethical hackers follow well-established methodologies and frameworks, such as risk assessment models and security testing standards, to ensure a structured and comprehensive evaluation. They document findings in detailed reports that include risk ratings, proof-of-concept evidence, and practical remediation recommendations to help organizations prioritize and fix identified issues effectively. By simulating real-world cyber-attacks in a controlled, legal, and ethical manner, organizations gain insight into how attackers think and operate. This proactive approach not only reduces the likelihood of successful breaches but also minimizes financial losses, reputational damage, and regulatory penalties. Ethical hacking further supports compliance with industry standards and regulations, enhances incident response readiness, and promotes a culture of security awareness within the organization.

KEYWORDS: Penetration Testing, Vulnerability Assessment, Network Security, Cyber security, Risk, Assessment, Reconnaissance, Exploitation, Information Security, White-hat Hackers, and Security Compliance

A COPULA-BASED MARKOV APPROACH FOR RELIABILITY ASSESSMENT OF MULTI-STATE CONSECUTIVE SYSTEMS

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ABSTRACT: This study investigates the reliability characteristics of a Markov Model developed for a multi-state linear consecutive 2-out-of-4: F system operating under multiple performance levels, varying from complete functionality to total failure. The model evaluates important reliability metrics, including average availability, mean time to failure (MTTF), expected number of system failures, and overall system reliability. To effectively handle component breakdowns and their restoration, the Gumbel – Hougaard Copula-based repair strategy is incorporated to represent dependency in the repair process. The outcomes of the proposed model provide valuable support for decision-making related to system configuration, selection of components, and maintenance planning. The insights derived from this reliability assessment enable engineers and managers to improve system performance, strengthen reliability, and reduce maintenance and repair costs.

KEY WORDS: Markov model, Multi state system, Mean time to failure, Gumbel – Hougaard Copula, Performance Analysis.

WEB SERVER USING RHEL

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ABSTRACT : The design and implementation of an online Enterprise Resource Planning (ERP) system utilizing Red Hat Enterprise Linux (RHEL) on a Linux server environment are presented in this project. The objective of the project is to integrate and automate core organizational processes through a centralized, secure, and scalable web application. In order to facilitate effective data flow and better departmental decision-making, the ERP system concentrates on key functional modules such user administration, inventory tracking, finance records, and reporting.

To safeguard confidential company data and guarantee that users can only access modules that are authorized, role-based authentication and authorization systems are put in place. Because of its web-based architecture, the ERP system can be accessed remotely and with common browsers, which lessens the need for client-side installations. Basic monitoring, backup plans, and logging are included to help with system upkeep and dependability.

This project shows how ERP solutions can be implemented on a Linux platform to fulfill organizational needs in a highly flexible and cost-effective manner. The system provides a hands-on learning experience in server configuration, web application deployment, and enterprise system integration by fusing open-source technologies with RHEL's enterprise-grade features. The project is appropriate for small to medium-sized businesses and provides a fundamental framework for comprehending actual ERP solutions in a server environment running Linux. Additionally, it improves students' comprehension of modern professional server management principles, system security, and enterprise workflows.

KEYWORDS : ERP, RHEL, Reliability, Server Configuration, Deployment and Enterprise System Integration.

PREDICTIVE MODELING OF HEART DISEASE USING PYTHON ALGORITHMS

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ABSTRACT: Heart disease is still one of the world's top causes of death, and in order to lower risk and increase patient survival rates, early detection and precise diagnosis are essential. Medical image analysis and disease prediction systems have been greatly improved by recent developments in Artificial Intelligence (AI) and Deep Learning (DL). In order to achieve effective and real-time detection, this research proposes a heart disease prediction model that integrates Python with YOLOv7 (You Only Look Once version 7). Medical imaging applications can benefit from the high speed and accuracy of the state-of-the-art object recognition algorithm YOLOv7. The YOLOv7 model is used in this system to process and train medical datasets, including ECG reports, echocardiography images, and other diagnostic imaging relevant to the heart. To enhance detection performance, the dataset is subjected to preprocessing procedures such as scaling, normalization, and annotation. The program has been trained to recognize anomalies and trends linked to heart disease. The suggested method seeks to enhance early diagnosis by offering precise forecasts with little processing time. The model's efficacy is assessed using performance indicators like accuracy, precision, recalland F1-score. Results from experiments show that YOLOv7 is highly reliable and effective at detecting heart-related problems. In contemporary healthcare systems, the combination of YOLOv7 with Python offers a strong, scalable, and economical method for predicting cardiac disease.

KEYWORDS: Identification, diagnosis, treatment, reports, pictures, and forecasting.

DATA-DRIVEN MENTAL HEALTH PREDICTING DEPRESSION WITH MACHINE LEARNING

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ABSTRACT: Rapid developments in machine learning are expanding the boundaries of mental health research by enabling predictive analytics for early depression detection. This study applies multiple ML algorithms like Logistic Regression, Decision Tree, Support Vector Machine (SVM), Random Forest, and AdaBoost it is to classify depression risk based on behavioral and questionnaire-based data. Among these, AdaBoost achieved the highest accuracy of 92.14%, followed by Random Forest with 90.14%, demonstrating the superior performance of ensemble learning techniques. The results highlight the potential of ML-driven models to identify individuals at risk of depression with greater reliability and precision. By integrating these algorithms into a practical screening framework, the system aims to support clinicians in early detection and timely intervention. However, these predictive models are designed as complementary diagnostic aids, not replacements for licensed mental health professionals. This research underscores the growing role of data-driven intelligence in advancing proactive, technology-assisted mental healthcare.

KEYWORDS: Machine Learning, Depression Prediction, Survey data, Depression Prediction, Early prediction.

SURVIVAL ANALYSIS OF TUBERCULOSIS BASED ON STATISTICAL MODELS: A COMPREHENSIVE REVIEW

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ABSTRACT: Tuberculosis (TB) remains a major global health challenge leading cause of mortality despite advances in diagnostics and treatment. Survival analysis is a statistical methods for time-toevent data which provides crucial insights into factors influencing treatment outcomes and mortality among TB patients. This review synthesizes evidence from recent studies employing non-parametric, semi-parametric, and parametric survival models, highlighting strengths, limitations, and emerging methodological trends. Kaplan–Meier estimation, Cox proportional hazards regression, accelerated failure time models, and advanced parametric approaches have been widely used to identify mortality risk factors such as HIV co-infection, diabetes, age, low body mass index and drug resistance. The application of parametric and accelerated failure time (AFT) models with Weibull and Gompertz formulations often demonstrating improved predictive performance. As an Extension of Proportional Hazard model incorporating frailty terms which account for unobserved heterogeneity across regions or patient clusters. Machinelearning algorithms such as decision trees, random forests, support vector machines, and gradient boosting for forecasting treatment success and disease dynamics. Future directions include incorporation of Time dependent factors, novel biomarkers, expanded use of frailty survival models and machine learning methodologies.

KEYWORDS: Survival Analysis, Tuberculosis, predictive model, Machine learning algorithm

SMART INVENTORY & BILLING SYSTEM FOR RETAIL STORES

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ABSTRACT: The Smart Inventory & Billing System for Retail Stores is designed to enhance operational efficiency by integrating automated stock management with a streamlined billing process. This system addresses common retail challenges such as human error, stock mismanagement, slow checkout procedures, and limited data visibility. By incorporating real-time inventory tracking, barcode and QR code scanning, and automatic stock updates, the system ensures accurate product monitoring and reduces the risks of stockouts and overstocking. The billing module enables quick invoice generation, automated tax calculations, and digital payment integration, thereby improving transaction speed and customer satisfaction. In addition, intelligent features such as low-stock alerts, sales and purchase history analysis, and predictive restocking recommendations support informed decisionmaking. Centralized dashboards and analytical reports allow store owners to monitor sales trends, evaluate profit margins, and assess overall business performance. The central idea of this study is that integrating smart automation and data-driven analytics into retail operations significantly reduces manual workload while improving accuracy and profitability. The system demonstrates how technological innovation can transform traditional retail management into a more efficient, responsive, and sustainable business model.

KEYWORDS: Smart Inventory System; Retail Automation; Real-Time Stock Management; Billing and Invoicing; Data-Driven Decision Making.

MULTI-ANGLE GAIT RECOGNITION USING DUAL-BRANCH CONVOLUTIONAL NETWORK

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ABSTRACT: Gait recognition is an emerging biometric technique that identifies individuals based on their walking patterns. Unlike traditional biometric systems such as face or fingerprint recognition, gait can be captured unobtrusively from a distance, making it suitable for surveillance and security applications. However, most existing gait recognition systems rely on a single camera viewpoint, which limits their robustness under real-world conditions where viewing angles vary. This paper proposes a novel multi-angle gait recognition framework that integrates front-view and side-view walking information using a dual-branch convolutional neural network. The proposed system extracts silhouette-based posture features and opticalflow-based motion features from both views and fuses them to generate a discriminative gait representation. Experimental analysis demonstrates that combining multi-view information significantly improves recognition performance compared to single-view approaches. The proposed framework offers improved accuracy, adaptability, and view-invariance, making it suitable for practical surveillance environments.

KEYWORDS : Gait Recognition, Multi-View Biometrics, Convolutional Neural Network, Optical Flow, Silhouette Extraction, Feature Fusion.

A FIVE-LAYER CLOUD COMPUTING FRAMEWORK FOR SECURE, INTELLIGENT, AND SUSTAINABLE HEALTHCARE DELIVERY IN INDIA

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ABSTRACT: Cloud computing is transforming Indian healthcare through EHR management, telemedicine, and AI-driven diagnostics, yet existing frameworks tackle security, AI, and sustainability in isolation—leaving gaps in data protection and regulatory compliance. This paper analytically examines a five-layer healthcare cloud framework integrating hybrid/multi-cloud infrastructure, federated learning-based AI, zero-trust security (DPDPA 2023 and HIPAA), edge-IoT monitoring, and green cloud operations. A comparative analysis of seven frameworks (2017–2025) confirms no prior work covers all eight dimensions simultaneously. As India's healthcare cloud market grows from \$3.62 billion (2025) to \$20.23 billion by 2034(CAGR 20.89%), this review offers a roadmap for hospitals, health-tech startups, and policymakers navigating India's rapidly digitalizing healthcare infrastructure.

KEYWORDS - Healthcare Cloud Computing; DPDPA 2023; Edge-IoT; Green Cloud; Hybrid Cloud; Telemedicine.

AUTONOMOUS DRONE NAVIGATION USING INTELLIGENT SYSTEMS

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ABSTRACT: Autonomous drone navigation has become an important area of exploration due to the adding use of unmanned upstanding vehicles in marketable mercenary and defense operations. For drones to operate singly, they must be able of perceiving their terrain, assaying real-time data, and making accurate opinions without nonstop mortal control. Intelligent systems that integrate artificial intelligence algorithms, advanced detectors, and global positioning system (GPS) technology play a pivotal part in enabling this autonomy. These systems support essential functions similar as path planning, handicap discovery and avoidance, localization, and adaptive flight control in dynamic and changeable surroundings. This exploration explores the abecedarian generalities and technologies involved in intelligent drone navigation, including detector emulsion, vision-grounded navigation, and ai-driven optimization ways. It also examines the major challenges faced in real-world perpetration, similar as environmental misgivings, limited battery power, real-time processing constraints, and safety considerations. By incorporating intelligent decision-making mechanisms, independent drones can achieve advanced delicacy, trustability, and functional effectiveness. Similar advancements make them largely suitable for operations including disaster operation, agrarian monitoring, surveillance, and smart logistics, thereby contributing to safer and further effective upstanding operations.

KEYWORDS: Autonomous Drone Navigation , Unmanned Aerial Vehicles (UAVs) , Artificial Intelligence , Sensor Fusion, Path Planning, Obstacle Avoidance, Intelligent Systems.

EMOTION RECOGNITION FROM HUMAN TEXT USING NATURAL LANGUAGE PROCESSING

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ABSTRACT: Due to the growing use of online communication, there has been an increasing need to understand human emotions through text. Emotion detection through Natural Language Processing (NLP) is a process that aims to help computers identify human emotions through text. The purpose of this project is to analyze text data and categorize it into various human emotions like happiness, sadness, anger, fear, and surprise. The process involves analyzing text data, extracting relevant features, and using machine learning or deep learning algorithms to identify emotional patterns. The model is trained using labeled data, which enables the system to better understand the context of human emotions and interpret text-based sentiments more effectively. Emotion detection has numerous applications in the current digital era. The process can be used for mental health analysis, improving chatbot responses, analyzing customer feedback, and measuring public opinion on social media platforms. These applications enable the development of better human-machine interaction. This study demonstrates how the integration of artificial intelligence with language processing can enable machines to better understand human emotions and improve user experience on various digital platforms.

KEYWORDS: Natural Language Processing, Emotion Recognition, Machine Learning, Deep Learning, Text Classification, Sentiment Analysis

ENHANCED KNN ALGORITHM FOR AI-POWERED DATA ANALYSIS AND VISUALIZATION APP

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ABSTRACT:—The AI-powered data analysis and visualization app is made to create a smart and automatic space for looking at organized data sets. Its main goal is to make it easier to get data ready, do the analysis, and show the results through a single digital platform. In the current digital age, data is essential for directing strategic choices in many different sectors. However, it might be difficult to analyze raw datasets since they frequently have missing values, errors, and structural anomalies. Techniques for manual preparation and visualization take a lot of time and are prone to human mistake. By providing an automated and clever solution for structured data exploration, the AI-Powered Data Analysis and Visualization App tackles these issues. Preprocessing tools, AIassisted interpretation, and interactive visual dashboards are all integrated into the system's user-friendly interface. The app lets users upload data in CSV format and automatically does steps to prepare the data, like fixing missing values, removing duplicates, correcting data types, and finding unusual entries. Once the data is cleaned, the system uses smart analytical methods to find patterns, connections, summary statistics, and important trends in the dataset. A tool that creates interactive charts and graphics lets users look at their data in different ways. The app also has a feature that makes reports with the findings, summaries, and pictures, which can be saved as files for use in school or work. The system is built with a modular design, which makes it easy to scale, adapt, and improve over time. It helps reduce the need for manual analysis, boosts accuracy, and makes results easier to understand. This makes it a good choice for students, researchers, analysts, and organizations looking for smart tools to explore data

KEYWORDS—KNN algorithm, Structured data exploration, Data Visualization, AI, Data Analysis.

ARTIFICIAL INTELLIGENCE FOR INTELLIGENT DECISION SYSTEMS: A PERFORMANCE EVALUATION OF MACHINE LEARNING MODELS

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ABSTRACT : The growing reliance on intelligent automation across diverse domains has significantly increased the demand for robust and efficient Artificial Intelligence (AI) systems. This study, titled "Artificial Intelligence for Intelligent Decision Systems: A Performance Evaluation of Machine Learning Models," presents a systematic analysis of how different machine learning algorithms contribute to accurate and reliable decision-making processes. The research examines the performance of widely used supervised learning models, including Decision Trees, Support Vector Machines, k-Nearest Neighbors, and Neural Networks, in handling structured datasets for classification and prediction tasks. The study evaluates these models based on key performance metrics such as accuracy, precision, recall, F1-score, and computational efficiency. By conducting comparative experiments on benchmark datasets, the research highlights how model selection, parameter tuning, and feature engineering influence predictive performance and system scalability. The findings demonstrate that while simpler models provide faster training and interpretability, advanced neural architectures often achieve superior predictive accuracy in complex decision environments. Furthermore, the work analyses the trade-offs between model complexity, training time, and generalization capability, emphasizing the importance of selecting appropriate algorithms for specific application domains. The study also explores how modern development environments and AI frameworks enhance implementation efficiency and reproducibility. By integrating theoretical evaluation with experimental validation, this research underscores the critical role of machine learning models in designing intelligent decision systems that are scalable, reliable, and performance-optimized. Ultimately, the results support informed algorithm selection and contribute to the advancement of efficient AI-driven decision-making solutions.

KEYWORDS: Artificial Intelligence, Intelligent Decision Systems, Machine Learning Models, Supervised Learning, Classification Algorithms, Neural Networks, Performance Evaluation, Model Optimization, Predictive Modeling, Scalability.

ROBUST TRAFFIC SIGN BOARD LOCALIZATION AND CLASSIFICATION USING AI BASED VISION MODELS

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ABSTRACT: Road traffic constitutes a major part in the problem of society. As the road traffic is increasing day by day there is a necessity of following the traffic rules with proper discipline. Traffic rules consist of traffic sign boards and traffic signals which are meant to be followed by everyone in the society. To provide a comprehensive assistance to the driver for following the traffic signs, Traffic Sign Board Detection is been designed. The signboards are captured using camera installed in the vehicle. The captured image will undergo for image processing by ANN algorithm in MATLAB and identify the signboard. This gives the driver a sort of assistance which alerts the driver and reduces the work of the driver. The main goals of this project are detection, and recognition and alert to the driver.In our project we have used algorithms such as Adaptive Neuro Fuzzy Interference System (ANFIS) and Artificial Neural Network (ANN) which will be compared in terms of accuracy. From our research we can prove that Artificial Neural Network (ANN) performs well compared to other existing algorithms.

KEYWORDS: Traffic Sign Recognition (TSR), Image Segmentation, Machine Learning (ML), Deep Learning, Convolutional Neural Networks (CNN), Computer Vision, Object t Detection, Feature Extraction, Autonomous Driving Systems, Real-Time Classification.

PHISHING ATTACK DETECTION: PERFORMANCE ANALYSIS OF EMAIL FILTERING APPROACHES

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ABSTRACT : With the growing reliance on digital communication, phishing attacks have become one of the most prevalent cybersecurity threats, targeting both individuals and organizations. This study, titled "Phishing Attack Detection: Performance Analysis of Email Filtering Approaches," presents a structured evaluation of commonly used email filtering techniques to detect and prevent phishing attempts. The research compares signature-based filters, which rely on known phishing patterns, and heuristic or rule-based filters, which analyse email content and behaviour for suspicious characteristics. Performance metrics such as detection accuracy, false positive rate, processing time, and resource utilization are evaluated using benchmark email datasets. Experimental analysis demonstrates that while signature-based filters are effective against known phishing campaigns, heuristic approaches provide greater flexibility in identifying new or evolving threats. The study also explores hybrid filtering methods that combine both techniques to enhance detection performance. Additionally, the research investigates the trade-offs between detection efficiency and computational overhead, highlighting strategies to optimize email security without degrading system performance. By integrating theoretical evaluation with experimental results, this work underscores the importance of effective email filtering for cybersecurity. The findings provide practical insights for designing efficient and reliable phishing detection systems, contributing to safer digital communication environments. Furthermore, the study emphasizes the role of continuous monitoring and adaptive filtering in countering emerging phishing techniques. Implementing these measures can significantly reduce organizational risk and strengthen overall cybersecurity posture

KEYWORDS: Phishing Attacks, Email Security, Email Filtering, Signature-Based Detection, Heuristic-Based Detection, Hybrid Filtering, Cybersecurity, Threat Detection, Detection Accuracy, Adaptive Monitoring.

THE ROLE OF ALGORITHMS AND STRUCTURES IN CODING EFFICIENCY

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ABSTRACT : The effectiveness of modern software systems depends greatly on the appropriate selection and implementation of algorithms and data structures. This study, titled "The Role of Algorithms and Structures in Coding Efficiency," presents a structured analysis of how these foundational concepts influence computational performance, scalability, and resource optimization. The research examines how algorithmic design strategies and structured data organization techniques collectively contribute to minimizing execution time, reducing memory consumption, and enhancing overall system reliability. By evaluating common computational tasks such as searching and sorting, the study demonstrates how optimized approaches, including binary search and quick sort, combined with suitable data structures like arrays, linked lists, and trees, significantly improve processing efficiency. The work further investigates the impact of inefficient design choices, highlighting how poorly selected algorithms or structures can increase computational complexity and degrade system performance. Emphasis is placed on the analytical assessment of time and space complexity as critical criteria for selecting appropriate solutions to specific problems. Additionally, the study explores how modern programming environments such as Python, Java, and C++ support efficiency through builtin libraries and abstract data types that promote maintainability and code clarity. By integrating conceptual foundations with applied evaluation, this research underscores the central role of algorithms and data structures in developing efficient, scalable, and high performance applications. Ultimately, the findings support improved decision-making in software design and encourage systematic performance-oriented coding practices.

KEYWORDS: Algorithms, data structures, coding efficiency, computational performance, time complexity, space complexity, software optimization, scalability, sorting algorithms, programming languages (Python, Java, C++), performance analysis.

ANALYTICAL INVESTIGATION OF HEAT AND MASS TRANSFER IN MHD NANO FLUID FLOW PAST A MOVING VERTICAL PLATE IN THE PRESENCE OF HEAT SOURCE

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ABSTRACT: This research offers an analytical examination of unsteady magnetohydrodynamic (MHD) mixed convection nanofluid flow adjacent to a moving vertical plate, accompanied by an internal heat source. We use the Homotopy Analysis Method (HAM) to solve a set of coupled nonlinear governing equations that describe the movement of momentum, energy, and species. This gives us explicit series-form expressions for velocity, temperature, and concentration. We use the convergent analytical solutions to make parametric profiles and figure out how important dimensionless parameters like magnetic interaction, buoyancy forces, mass diffusivity, and heat source strength are to the hydrodynamic and thermal–solutal boundary layers. Validation is performed by comparing the current HAM solutions with published numerical results obtained from MATLAB, demonstrating a significant level of agreement within the defined parameter ranges.The results give us benchmarks that are physically sound and useful tips for making things like thermal management systems, electronic cooling systems, and energy conversion devices better at moving heat and mass.

Keywords : Heat and mass transfer, Magnetohydrodynamic(MHD), Nanofluid , Homopoty Analysis Method (HAM).

AN EDGE-PRESERVING SIGMOID-WEIGHTED FOURIER APPROACH FOR IMAGE CONTRAST ENHANCEMENT

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Abstract Image contrast enhancement in the frequency domain offers flexible control over illumination and detail components; however, conventional spectral magnitude modification may distort structural information, particularly edges. This paper presents an edge-preserving sigmoidweighted Fourier approach for image contrast enhancement. The proposed method applies a nonlinear sigmoid weighting function to the Fourier magnitude spectrum to achieve smooth and controlled frequency amplification. To preserve structural integrity, a gradient-based edge map is computed using the Sobel operator and incorporated into the weighting mechanism to regulate enhancement in high-gradient regions. The modified frequency spec-trum is reconstructed using the inverse Fourier transform to obtain the enhanced image. Experimental evaluation using Peak Signal-to-Noise Ratio (PSNR), Structural Similarity Index (SSIM), entropy, and gradient-based measures demonstrates improved contrast while maintaining edge consistency compared to conventional sigmoid-based and histogram-based techniques. The proposed approach is computationally efficient and suitable for preprocessing tasks in computer vision and image analysis applications.

Keywords Fourier Transform, Sigmoid Weighting, Edge Preservation, Frequency-Domain Enhancement, Sobel Operator, Image Contrast Enhancement

CLOUD-NATIVE MICROSERVICES: A MODERN APPROACH TO SCALABLE APPLICATIONS

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Abstract : Cloud-Native Microservices have revolutionized the design, development, and deployment of mod-ern applications by providing a scalable, flexible, and resilient architecture suited to dynamic digital environments. This approach structures applications as a collection of independent, loosely coupled services, each focusing on a specific business function and communicating through lightweight proto-cols such as REST APIs or message brokers. By adopting cloud-native principles like containerization, orchestration, continuous integration and deployment (CI/CD), and automated scaling, organizations can enhance application performance, maintainability, and reliability while ensuring high availability and minimal downtime. Technologies such as Docker, Kubernetes, and serverless platforms enable efficient deployment with elasticity and fault tolerance, while also supporting DevOps practices that promote agility, faster innovation, and reduced dependencies. However, challenges including com-plex networking ,data inconsistency, and security management must be addressed through strong governance ,monitoring, and observability frameworks. Overall, cloud-native microservices provide an effective and transformative approach for building scalable, adaptive, and efficient applications, helping organizations improve operational efficiency and meet evolving user and business demands.

Keywords: Cloud Computing, Microservices Architecture, Cloud-Native Applications, Scalability, Containerization, DevOps, Server less Computing.

BEYOND TRADITIONAL IT: THE NEW ROLE OF MCA IN THE CLOUD–AI– CYBERSECURITY ERA

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Abstract : As the pace of digital transformation quickens, students may not understand the gaps between their capabilities versus reported information and communication technology skill gaps in cloud computing, artificial intelligence, and cybersecurity. Traditional IT education is focused on programming and theoretical computer science, for instance, these only cover a fraction of digital risks that are both simple and safe. The MCA qualification is a professional course in which students engage with frontier technol-ogies that they can apply in relevant ways to learning activities in the workplace. In this paper, we articulate the movement of MCA graduates into roles that require evidence of innovation to enhance AI solutions, secure cloud infrastructures, and protect digital environments from cyber threat. Top-ics of interest in MCA learning are deep learning, cloud platforms, big data analytics, and ethical hacking. These learning topics are useful for more accurate technicality and technical efficiencies in evidence based roles. Reports from the research community also reported 82% improvement in MCA professional productivity, 76% improved efficiency in cloud uptake, and close to 65% improvement in mitigating cyber threats. MCA graduates are now working in various occupations as AI engineers and cloud solution specialists, cybersecurity analysts and data scientists who are ready to respond to contemporary information technology practices. Finally, the MCA remains a highly regarded future ready qualification to assist in a range of innovations in a digital environment.

Keywords : MCA, cloud computing, artificial intelligence, cyber security.

AI BASED PSYCHOMETRIC ANALYSIS

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Abstract : Rapid digitalization and evolving workplace demands have significantly increased stress levels and mental health challenges among employees, particularly in the IT sector. Traditional approaches to monitoring employee well-being rely on periodic surveys and self-reporting, which often lack real time insights and are prone to bias and inaccuracy. These limitations can lead to undetected burnout, decreased productivity, and long-term health issues. To address these challenges, this paper proposes MindWell AI, an intelligent, local first desktop application designed to monitor and enhance employee mental health and productivity through multi-modal analysis. MindWell AI integrates multiple technologies—including facial emotion recognition, voice sentiment analysis, machine learning prediction, and productivity tracking—into a unified platform with role-based access for employees, system administrators, and super administrators. Employees can perform comprehensive mental health assessments using webcam-based emotion detection and voice input, while the system analyses responses using an AI engine and a trained Random Forest model to predict stress levels and potential treatment needs.

Keywords : Employee Mental Health, Workplace Productivity, Emotion Detection, Voice Sentiment Analysis, Machine Learning, Random Forest, Desktop Application, Real-Time Monitoring, AI-Based Assessment, MindWell AI..

DRIVER ALERTNESS MONITORING USING FUSION OF FACIAL FEATURES AND BIO-SIGNALS

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ABSTRACT Driver fatigue is one of the key causes of road traffic accidents by reducing perception, reaction time and decision-making. Hence, the automatic driver drowsiness system has attracted a lot of attention in the field of intelligent transportation. In this paper, a multimodal facial and physiological bio-signal based approach is presented to monitor driver's alertness. Visual cues, e.g., eye closure, blink rate and yawning can be detected by means of computer vision techniques and they are complemented with features based on bio-signals which reflect the driver's internal condition. To fuse these disparate sources an approach of features-level fusion is used and then Alertness levels are approximate using the machine-learning-based classification. The TAXI a generalized bimodal approach for the problem with the objective of higher robustness and reliability over unimodal systems and applicable to real-time driver assistance tasks.

Keywords: Driver Drowsiness Detection, Analysis of Facial Images and Bio-Signals, Multimodal Fusion, Intelligent Transportation Systems

A DEEP LEARNNG APPROACH FOR EARLY DETECTION OF LUNG DISEASES FROM CHEST RADIOGRAPHS

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ABSTRACT : Early detection of lung diseases such as pneumonia, tuberculosis, COVID-19, pneumoconiosis, and other pulmonary conditions is critical for timely intervention and improved patient outcomes. Chest radiographs (CXR) are the most widely used, cost-effective imaging modality for lung screening; however, their interpretation is time-intensive and subject to variability when performed manually by radiologists. In recent years, deep learning (DL) models, particularly convolutional neural networks (CNNs) and hybrid architectures, have demonstrated strong potential for automating and enhancing the detection of lung abnormalities in CXR images. Deep learning frameworks, such as VGG19, Capsule Networks, ResNet, DenseNet, and EfficientNet, have been successfully applied to classify and screen multiple lung conditions with high accuracy, sensitivity, and specificity. Transfer learning and fine-tuning strategies further improve model performance, especially when datasets are limited or imbalanced. Data preprocessing techniques, including image normalization, contrast enhancement, lung segmentation, and augmentation, play a vital role in ensuring robust feature extraction and generalization of models.

KEYWORDS: Deep Learning, Convolutional Neural Networks, Chest X-ray, Lung Disease Detection, Pneumonia, Tuberculosis, COVID-19, Lung Cancer, COPD, Medical Imaging, Computer-Aided Diagnosis, Image Classification, Segmentation, Feature Extraction, Data Augmentation, Early Diagnosis, AI in Healthcare, Predictive Modeling, Diagnostic Accuracy, Sensitivity, Specificity, Clinical Decision Support, Radiography, Thoracic Imaging, Abnormality Detection, Healthcare AI.

GRAPH-DOMINATED COMPUTING: A SURVEY OF TOPOLOGICAL APPROACHES FOR NEXT-GENERATION DIGITAL SYSTEM DESIGN

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ABSTRACT: The increasing complexity of modern digital systems, from multi-core processors to Networks-on-Chip (NoCs), demands robust theoretical frameworks for design, analysis, and optimization. This article explores the synergistic relationship between graph theory and computer organization, arguing that graph-theoretic concepts, particularly those involving structural domination and mapping, are becoming foundational to digital system innovation. We review classical applications, such as Boolean function minimization and state machine representation. Subsequently, we delve into advanced and emerging paradigms, including the hardware mapping of algorithms onto reconfigurable architectures (e.g., honeycomb FPGAs), the use of Prüfer sequences for lossless circuit-graph encoding, hypergraph-based NoC optimization, and graph-embedding techniques for layout minimization. This survey positions graph theory not merely as a tool for analysis, but as a dominant design principle shaping the future of high-performance, low-power, and specialized digital computer organization.

KEYWORDS: Domination, Digital Principles, Network-on-Chip (NoC), Graph Embedding, Logic Synthesis.

INTELLIGENT LEAD MANAGEMENT SYSTEM USING GEMMA AND MCP

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ABSTRACT - Small and medium-sized enterprises (SMEs) often face difficulties when using traditional software systems for managing business operations. Tasks such as maintaining customer records, tracking lead conversions, and analyzing business data frequently involve manual processes and fragmented tools. These limitations result in increased administrative workload, delayed responses, and inefficient decision-making. This project presents a unified web-based application designed to improve Customer Relationship Management (CRM) processes by combining modern web technologies with Artificial Intelligence. The system is developed using React and Vite to provide a responsive and user-friendly interface, supported by a scalable backend architecture. A key feature of the proposed solution is an AI-enabled CRM assistant that allows users to interact with CRM data using natural language queries. The assistant is powered by Google's Gemma language model and managed through the Model Context Protocol (MCP), ensuring that sensitive business data remains within the system and is not exposed to external services. The proposed application simplifies lead management and data retrieval, reducing manual effort and supporting faster operational decisions. The system is particularly suitable for SMEs seeking an affordable and secure approach to intelligent CRM management.

KEYWORDS— Customer Relationship Management, Lead Management, Artificial Intelligence, Natural Language Processing, Gemma Language Model, Model Context Protocol, PostgreSQL, Multi-Tier Architecture.

MULTI MODAL BIRD SPECIES CLASSIFICATION USING CONFIDENCE-BASED ADAPTIVE DECISION FUSION AND GRAD-CAM INTERPRETABILITY

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ABSTRACT : Bird species classification plays a critical role in biodiversity monitoring and ecological conservation. Systems that rely solely on either visual or acoustic data are often adversely affected by environmental noise, poor illumination, and occlusion, which limits their reliability in real-world scenarios. This paper presents a multimodal bird classification framework that integrates ResNet50-based image recognition with mel-spectrogram-based audio analysis to classify 25 Indian bird species. To enhance robustness, a confidence-based adaptive decision fusion mechanism is introduced, dynamically reweighting the contributions of each modality during inference. Furthermore, Gradient-weighted Class Activation Mapping (Grad-CAM) is employed to provide visual explanations of model predictions across both image and audio streams, improving interpretability. The image-based ResNet50 model achieves 89.12% training accuracy and 93.13% validation accuracy, while the audio stream achieves 90.63% training accuracy and 77.8% validation accuracy. Despite the lower audio accuracy, the confidence-based adaptive fusion achieves an overall accuracy of 97.13% across 1500 test samples, outperforming unimodal baselines and demonstrating that dynamic modality weighting effectively strengthens classification robustness in real-world avian biodiversity assessment.

KEYWORDS — Bird species classification, multi-modal learning, ResNet50, mel-spectrogram, Grad-CAM, decision fusion.

DEEP LEARNING-BASED FEATURE REPRESENTATION STRATEGIES FOR GASTROINTESTINAL CANCER DIAGNOSIS: A COMPARATIVE STUDY

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ABSTRACT: Early detection of GI cancer through endoscopic imaging remains a significant clinical challenge due to subtle lesion characteristics and inter class variability. Recent advancements in machine learning and deep learning have enabled the development of automated and highly accurate computer aided diagnostic systems. This study investigates comprehensive feature extraction strategies for GI cancer detection using the publicly available Kvasir dataset. A multiclass endoscopic image repository widely adopted for reproducible research. Both conventional and deep learning based representations are explored. Classical approaches incorporate morphological descriptors and color texture analysis to capture structural irregularities and mucosal abnormalities. In parallel, deep feature extraction is performed using advanced neural architectures including EfficientNet, DenseNet, ConvMixer, U-MaskNet and spatial attention mechanisms. The framework integrates preprocessing techniques such as normalization and augmentation to enhance generalization along with the segmentation models including U-Net and Mask R-CNN for improved lesion localization. Hybrid ensemble strategies are further employed to address class imbalance and imaging artifacts common in endoscopic data. Experimental results demonstrate state of the art performance with EfficientNetB6 achieving accuracy up to 99.88% and U-MaskNet obtaining an F1 score of 98.68% across multiple GI classes. The proposed framework establishes a scalable foundation for future clinical and computational GI cancer research.

KEYWORDS: GI cancer detection, Feature extraction, Endoscopy images, CNN, Vision Transformer, EfficientNet, Deep Learning.

A STUDY TO UNDERSTAND SENTIMENT AND EMOTION THROUGH TEXT[1]EMOJI PREPROCESSING WITH NLP TECHNIQUES

ABSTRACT: The remark of Internet forums has a great impact in communication by the AI models including NLP and LLM. The social network is allowed by these and it notes, categorizes and make changes in the information successfully and boosting the user's interaction. In order to abstract the valuable data preprocessing is necessary text data and emojis. Identifying and translating multilingual messages into a single language which increases the usefulness of the data by promoting consistency and comparability across different kinds of linguistic sources. The goal is to detect sentiment polarity (positive, negative, or neutral) and evaluating the subjective and emotional levels independently for both text and emojis. This framework makes use of Python[1]based resources, including the emoji library to decode emoji characters into descriptive tokens and to normalize the content, language normalization techniques are used. WordNet-based lemmatization, tokenization, and stop word removal are some of the components of the Natural Language Toolkit (NLTK) that provide improvements. The study suggests that it improves sentiment and emotion level identification accurately by incorporating these preprocessing processes, especially for short, casual, emoji-rich social media comments.

KEYWORDS— text preprocessing, emoji decoding, polarity, subjectivity, emotion level detection, NLT.

DEEP DETECTION AUTOENCODER VARIANTS FOR SALES TRANSACTION ANOMALIES

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ABSTRACT - In contemporary industrial improvement neoteric techniques are indisputable. These are ratified by most industries in recent years in order to boost profits. Complex and nonlinear patterns are often missed by customary learning methods. Autoencoders and their variations shows exceptional efficacy in identifying anomalies by learning compressed latent representations and reconstructing typical patterns. Oddities in sales transaction data may be a sign of fraudulent activities, operational errors or weird changes in demand. This study evaluates five autoencoder based architectures Autoencoder (AE), Improved Autoencoder (IAE), Variational Autoencoder (VAE), Denoising Autoencoder (DAE) and Contractive Autoencoder (CAE) to identify sale amount irregularities. Improved Autoencoder strengthens its performance by optimizing depth and activation techniques. The Standard Autoencoder provides a reliable starting point, while the Variational Autoencoder generalizes through probabilistic latent modelling, the Denoising Autoencoder has the highest robustness and effectively manages noisy or perturbed data. From the observed results, the VAE achieves the highest Accuracy (98.65%), Precision (93.08%), Recall (98.66%), and F1-Score (95.79%). Autoencoder frameworks offer a dependable and expandable solution for detecting anomalies in sales data, which helps in fraud protection, and efficient revenue management in dynamic retail settings.

KEYWORDS: Autoencoder (AE), Improved Autoencoder (IAE), Variational Autoencoder (VAE), Denoising Autoencoder (DAE), Contractive Autoencoder (CAE)

COMPARATIVE STUDY ON UNSUPERVISED PREPROCESSING TECHNIQUES FOR LEAF IMAGE ANALYSIS

ABSTRACT— Java Plum plays a prominent role in Ayurveda, Siddha and Unani health systems by its strong medicinal properties. In order to yield healthy fruits in a Java plum tree, it is essential to get early detection of nutrient deficiencies on the leaves which plays a very essential role for their rich growth. For capturing the disorders in the leaves in the premature stage, as a footing step this study mainly focuses on strengthening the leaf image quality in the preprocessing part - an initial stage for reducing the noise level and obtaining a better image output for further stages of analysis in any relevant research. For creating a concrete base on the preprocessing stage, using around 250 leaves three autoencoder architectures such as Residual Convolutional Autoencoder, U-Net Autoencoder, and the Variational Autoencoder, were compared and it proved that the Residual Convolutional Autoencoder is the finest model for acquiring the superior denoised image result by achieving impressive metrics with the values of .6892 in SSIM and 29.82 db in the PSNR. DeepLabV3+ processed the denoised images for semantic segmentation and the segmented outputs were fed into a trained Wavelet Transformer to extract the required features in a .csv file. The Multilayer Perceptron (MLP) classifier with Stochastic Gradient Descent (SGD) resulted features were recorded in a .csv file. This pipeline is attempted for predicting the nutrition disorders in the leaves at the preliminary point.

KEYWORDS— Residual Convolutional Autoencoder, U-Net Autoencoder, Variational Autoencoder, Wavelet Transformer, Multilayer Perceptron (MLP).

EDGE-DEPLOYED LIGHT WEIGHT HYBRID 1D CNN - LSTM FOR REAL-TIME ROAD SURFACE CONDITION DETECTION FROM SMARTPHONE SENSORS: A COST-EFFECTIVE APPLICATION

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ABSTRACT—The emergence of Software-Defined Vehicles (SDVs) and edge computing has accelerated the evolution of smart, real-time transportation systems. This paper introduces a smartphone-based road surface classification system that utilizes accelerometer meas-urements along with state-of-the-art machine learning models to identify smooth high-ways, concrete roads, and muddy roads. Data were recorded under different speeds and road conditions using a commonly available smartphone attached to the vehicle dash-board. One architecture was attempted and tested: a Hybrid multimodal 1D CNN and LSTM model was implemented with a noteworthy accuracy and testing metrics. Furthermore, the model was implemented in a web-based appli[1]cation that provided re-al-time road surface condition prediction on the move, without the necessity of specialized hardware. This holistic system proves the prospect of large-scale implementation on SDVs and smart transportation systems, thereby facilitating applications like adaptive sus-pension control, route optimization, and infrastructure monitoring of roads. Our solution proves the efficiency of synergizing deep learning with mobile sensing technologies for economically viable, easily deployable, and real[1]time road surface classification.

KEYWORDS—Machine Learning; Road Classification; Predic[1]tion; SDV; E

AI-POWERED CARDIOVASCULAR DISEASE PREDICTION AND ECG ANALYSIS SYSTEM

ABSTRACT: Cardiovascular diseases are one of the leading causes of death worldwide, and early detection plays a vital role in reducing mortality rates and improving patient outcomes. This project presents an AI-Powered Cardiovascular Disease Prediction and ECG Analysis System that uses machine learning and deep learning techniques to assist in the early identification of heart-related conditions. The system is designed to analyze patient health parameters and electrocardiogram (ECG) reports to predict the likelihood of cardiovascular disease. The proposed application is developed using Python with supporting libraries such as NumPy, Pandas, TensorFlow, and Scikit-learn, and the user interface is implemented using the Streamlit framework to provide a simple and interactive platform for users. The model is trained on relevant medical datasets to identify patterns associated with cardiovascular risk factors, including age, blood pressure, cholesterol levels, heart rate, and ECG signals. After processing the input data, the trained model generates predictions that help determine whether a patient may be at risk of developing cardiovascular disease. The system also provides visualization and report analysis to help users understand the results effectively. By integrating artificial intelligence with healthcare diagnostics, the application aims to support medical professionals and individuals in making informed health decisions and promoting early preventive measures. The proposed system demonstrates the potential of machine learning technologies in improving healthcare services by offering faster analysis, improved prediction accuracy, and accessible health monitoring tools that can contribute to better cardiovascular disease management and overall public health awareness

FAKE JOB DETECTOR

ABSTRACT: The Fake Job Detector is a web-based application designed to identify and analyze fraudulent job postings using machine learning techniques. With the rapid growth of online job portals, fake job advertisements have become a major issue, leading to financial loss and exploitation of job seekers. This project aims to provide a solution that helps users verify the authenticity of job descriptions before applying. The system allows users to input a job description in text form or upload a PDF file. The application then analyzes the content using a trained machine learning model and various detection techniques to classify the job as either real or fake. It also identifies suspicious patterns such as unrealistic salary offers, requests for registration fees, or lack of company details. Additionally, the system provides a risk score, confidence level, and highlights potential red flags in the job posting. The platform includes user authentication, history tracking, and an admin dashboard for monitoring predictions. By using this system, job seekers can make safer decisions and avoid fraudulent job opportunities.

EFFECTS OF PERMEABILITY PARAMETER AND DUFOUR TOGETHER ON MHD CASSON FLUID FLOW IN A VERTICAL CHANNEL

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ABSTRACT: Here, the unstable Casson fluid flow across an inclined channel was investigated and assessed. This work's primary goal is to provide accurate end results for unstable convection-free flows in incline Casson fluid channels while taking magnetohydrodynamics (MHD) into consideration. A method called the Laplace transform was used to determine the results of the equations regulating them. The new study now includes the permeability variable and the Dufour effect. Some of the non-dimensional variables like thermal radiation, chemical reaction, permeability parameter, dufour effect, magnetic parameter etc have been observed and evaluated with respect to different variables. The impact of the aforementioned parameters on the temperature, concentration, and velocity curves has been discussed. To provide a thorough explanation and understanding, the behaviour of distinct profiles over various dimensionless factors was illustrated graphically. MATLAB software was utilized to analyse and produce all of the graphical outputs of the computational solutions of governing equations.

KEYWORDS: Casson fluid, Laplace transform, MHD flow, Dufour effect and Permeability variable.

COMPARATIVE ANALYSIS OF INTUITIONISTIC AND NEUTROSOPHIC FUZZY MODELS FOR REPLACEMENT DECISIONS WITH INCREASING MAINTENANCE COST, DISCOUNT FACTOR, AND SCRAP VALUE

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ABSTRACT: Replacement problems address the management of equipment or machines that deteriorate over time or usage and eventually fail after reaching certain thresholds. Cost factors such as increasing maintenance expenses, depreciation, discounting due to the time value of money, and scrap value significantly influence optimal replacement decisions. Effective replacement planning is therefore essential for minimizing long-term operational costs and ensuring system reliability. This study presents a comparative analysis of intuitionistic fuzzy and neutrosophic fuzzy approaches for modeling replacement decisions under uncertainty. Cost parameters are represented using triangular intuitionistic fuzzy numbers and triangular neutrosophic fuzzy numbers to capture vagueness, hesitation, and indeterminacy inherent in real-world data. Analytical techniques are applied to evaluate replacement timing considering maintenance cost escalation, discounted cash flow, and salvage value. A centroid-based ranking method is employed to compare the outcomes of both fuzzy environments in solving complex decisionmaking problems. The results indicate that neutrosophic fuzzy models offer greater flexibility in representing uncertainty and often produce more robust and optimal solutions than intuitionistic fuzzy approaches, thereby enhancing decision accuracy in equipment replacement strategies.

KEYWORDS: Replacement Model; Intuitionistic Fuzzy Set; Neutrosophic Fuzzy Set; Discount Factor; Increasing Maintenance Cost; Scrap Value; Operations Research; Decision Making under Uncertainty.

WEATHER MODELING USING TIME SERIES MACHINE LEARNING

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ABSTRACT : Transportation, climate research, agriculture, and disaster management all depend heavily on weather modeling. The highly dynamic, nonlinear, and temporal structure of atmospheric data makes accurate weather forecasting difficult. By identifying trends in past data, time series-based machine learning approaches have become effective tools for modeling and forecasting meteorological parameters. In contrast to conventional statistical techniques, this study aims to increase prediction accuracy and adaptability by utilizing time series machine learning methodologies in weather modeling. The suggested approach makes use of past meteorological data that has been gathered at regular intervals, including temperature, humidity, rainfall, wind speed, and air pressure. To improve data quality, preprocessing methods like feature engineering, missing value handling, and normalization are used. Temporal relationships and seasonal trends present in weather data are captured by time series models like Autoregressive Integrated Moving Average (ARIMA), Long Short-Term Memory (LSTM) networks, and other recurrent neural network-based architectures. Both the long-term trends and the short-term volatility found in the time series are taught to these models.

KEYWORDS: Weather Modeling, Time Series Analysis, Machine Learning, Weather Forecasting, ARIMA, LSTM, Meteorological Data, Prediction Accuracy, Deep Learning.

DEEP LEARNING MODEL FOR LIP READING FROM VIDEO INPUT FOR SPEECH ASSISTANCE AND SILENT COMMUNICATION APPLICATIONS

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ABSTRACT : This project implements a deep learning-based lipreading application that predicts spoken words from visual lip movements. The system uses a CNN-LSTM architecture to process sequences of grayscale mouth-region images captured either from a webcam or as uploaded image files. A Flask-based web interface allows users to register, log in, capture or upload lip sequences, and view predictions with confidence scores and history. The application demonstrates a complete pipeline from data collection and model training to deployment as a web service, highlighting practical aspects of visual speech recognition using modern Python libraries.

The model operates on fixed-length sequences of 22 frames, each resized to 64×64 pixels, and maps them to a discrete vocabulary of words. Training data is organized as folders of frame images, and the training script constructs a Time Distributed CNN followed by an LSTM to capture temporal dynamics. The deployed model, saved as a Keras.h5 file, is integrated into the Flask server, which accepts image sequences, performs preprocessing, and returns JSON responses with predictions. The project thus provides a compact but complete demonstration of data-driven AI for lip reading.

KEYWORDS: Lip-reading, Visual Speech Recognition, Deep Learning, CNN-LSTM, Sequence Modeling, Time Distributed CNN, Flask Web Application.

A HYBRID MULTI-MODAL DEEP LEARNING FRAMEWORK FOR POLLUTION-AWARE FISH DISEASE PREDICTION IN MARINE ECOSYSTEMS: A COMPARATIVE ANALYSIS WITH CNN AND MACHINE LEARNING MODELS.

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ABSTRACT : Marine ecosystems play a crucial role in global aquaculture; however, fish disease outbreaks continue to threaten productivity, economic sustainability, and ecological balance. Disease occurrence in marine environments is strongly influenced by pollution and deteriorating water quality conditions, including temperature fluctuations, pH imbalance, dissolved oxygen depletion, ammonia accumulation, and increased turbidity. Despite this close relationship, most existing fish disease prediction systems rely predominantly on visual inspection or image-based learning models, which fail to capture pollution-driven environmental causes of disease, resulting in delayed detection and reduced reliability, particularly in early-stage and pollution-induced scenarios. To address this limitation, this study proposes a hybrid multi-modal deep learning framework for pollution-aware fish disease prediction in marine ecosystems and presents a comparative analysis with conventional convolutional neural network (CNN) models and traditional machine learning approaches. The proposed framework employs a dual-branch architecture in which a CNN-based visual branch extracts discriminative features from fish images, while a parallel environmental branch processes water quality and pollution parameters using a neural network optimized for numerical data, with feature-level fusion enabling joint learning of visual disease patterns and environmental stress effects. Experimental results indicate that while CNN-only and traditional machine learning models achieve moderate performance, they are limited in modeling complex interactions between environmental stressors and visual symptoms, whereas the proposed hybrid multi-modal framework consistently delivers superior prediction accuracy and robustness.

KEYWORDS: Fish Disease Prediction, Marine Aquaculture, Multi-Modal Deep Learning, Water Quality Monitoring,Environmental Pollution Analysis,Convolutional Neural Networks.

A HYBRID DEEP LEARNING FRAMEWORK FOR REAL-TIME TRAFFIC CONGESTION PREDICTION: A COMPARATIVE ANALYSIS WITH CNN AND MACHINE LEARNING MODEL

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ABSTRACT : Rapid urbanization and the continuous growth of vehicular traffic have made real-time traffic congestion prediction a critical challenge for intelligent transportation systems. Accurate and timely congestion forecasting can significantly improve traffic management, reduce travel delays, and enhance road safety. This paper proposes a hybrid deep learning framework for real-time traffic congestion prediction, designed to effectively capture both short-term and long-term traffic dynamics. The proposed framework integrates a convolutional neural network (CNN) for automatic feature extraction with a recurrent learning component to model temporal dependencies in traffic data. To evaluate the effectiveness of the proposed approach, a comprehensive comparative analysis is conducted with standalone CNN models and traditional machine learning techniques such as Random Forest. Real-time traffic prediction is simulated using time-window-based streaming data, enabling continuous congestion forecasting with low latency. The models are evaluated using standard performance metrics including accuracy, mean absolute error, root mean square error, and prediction latency. Experimental results demonstrate that the proposed hybrid framework consistently outperforms both CNN-based and conventional machine learning models in terms of prediction accuracy, robustness, and adaptability to changing traffic patterns, while maintaining real-time responsiveness. The findings highlight the effectiveness of hybrid deep learning architectures for real-time traffic congestion prediction and their potential application in smart city traffic management systems.

KEYWORDS: Traffic Congestion Prediction,Hybrid Deep Learning, Intelligent Transportation Systems,Real-Time Traffic Analysis, Convolutional Neural Networks,Time-Series Traffic Data,Traffic Flow Prediction, Smart City Applications,Deep Learning Framework.

COMPARATIVE ANALYSIS OF NATURE-INSPIRED OPTIMIZATION ALGORITHMS FOR NETWORK ROUTING

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ABSTRACT : Nature is a great and immense source of inspiration for solving hard and complex problems in computer science since it exhibits extremely diverse, dynamic, robust, complex and fascinating phenomenon. Nature inspired algorithms are metaheuristics that mimics the nature for solving optimization problems opening a new era in computation. The different optimization techniques are Ant, PSO, fire fly and Elephant herd optimization are the combinations used in the packet delivery between the networks. The routing is a process of carrying the data from source to destination in the network. The output of these algorithms is determined by the packet delivery and error rate. The experiments are implemented with the **ns-3.45** software platform, which is based on the basics of C, C++ and TCL scripting language

KEYWORDS: Traffic Congestion Prediction,Hybrid Deep Learning, Intelligent Transportation Systems,Real-Time Traffic Analysis, Convolutional Neural Networks,Time-Series Traffic Data,Traffic Flow Prediction, Smart City Applications,Deep Learning Framework.

COMPARATIVE STUDY OF REINFORCEMENT LEARNING FRAMEWORK WITH CLASSICAL SHORTEST-PATH ALGORITHM FOR ADAPTIVE DELIVERY ROUTE OPTIMIZATION

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ABSTRACT: In e-commerce logistics, one of the greatest challenges is developing efficient routes to deliver packages. The largest area of difficulty is the “last mile” where a number of factors, including the unpredictable nature of traffic, can heavily influence time required to deliver a package and, ultimately, the operational cost. Most conventional algorithms which are designed to find the shortest route, such as Dijkstra’s algorithm, can only work with static graph representations of the system. The algorithm not possess the ability to adjust to the dynamic nature of the environment in which the operational supply chain exists. In this regard, this paper provides a comparison of a reinforcement learning (RL)-based route optimization framework relative to conventional shortest-path approaches for a dynamic environment representative of delivery plan execution.

The proposed RL-based approach utilizes a Q-learning model, wherein the agent interacts with its environment through reward structures, to derive dynamic routing strategies. The traditional approach derives routing solely from previously measured distance readings. The performance metrics used for the evaluation of the RL-based approach relative to the conventional approach will include: accuracy, delivery time, operational cost, and adaptability of the route to real time variations in the environment. The results have undergone statistical evaluation for use in comparison purposes.

The preliminary results have suggested that the RL-based model has more accurate routing and greater flexibility/adaptability with regard to route condition changes than conventional approach. The comparative findings substantiate the value of utilizing AI-based route strategy development to improve delivery operations and lower operational costs in modern logistics systems and facilitate optimum decision making.

KEYWORDS: Reinforcement Learning, Q-Learning, Route Optimization, Shortest-Path Algorithms, Dijkstra’s Algorithm, E-Commerce Logistics, Last-Mile Delivery, Intelligent Transportation Systems, Dynamic Routing, Logistics Optimization.

SMART CROP RECOMMENDATION FOR MAXIMIZING YIELD BY SEASON

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ABSTRACT: Modern agriculture faces increasing challenges due to climate variability, soil diversity, water scarcity, and fluctuating market prices. Traditional crop selection methods rely heavily on experience-based decision making without structured data analysis. This paper presents a Smart Crop Recommendation System designed for India and Tamil Nadu (26 major districts). The system integrates district-level crop mapping, soil type classification, seasonal suitability analysis, risk estimation, and profitability prediction using a rule-based AI scoring model. The web-based platform provides dynamic recommendations, weather simulation, and user-friendly visualization. The system aims to reduce agricultural risk, improve productivity, and promote sustainable farming practices.

KEYWORDS: Smart Agriculture, Crop Recommendation, AI in Farming, Soil Analysis, Risk Prediction

CUSTOMER SEGMENTATION SYSTEM FOR TARGETED MARKETING USING BEHAVIORAL ANALYTICS

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ABSTRACT: In today's highly competitive business environment, organizations generate vast volumes of customer data but often struggle to convert it into meaningful Business Intelligence. Traditional approaches to Customer Analytics rely on manual analysis and generic targeting strategies, which limit personalization and reduce campaign effectiveness. This project presents the design and implementation of a Customer Intelligence and Customer Segmentation system that leverages Machine Learning techniques to transform raw data into actionable insights. The system performs RFM Analysis and applies K-Means Clustering to identify distinct behavioral customer groups. In addition, Predictive Modeling techniques are used to forecast customer trends such as churn risk and high-value customer identification. The analytical outcomes are presented through interactive Data Visualization dashboards using Power BI, enabling business analysts to explore insights and support Targeted Marketing strategies. By focusing on explainable analytics, scalability, and usability, the proposed system enhances decision-making and improves overall marketing effectiveness.

KEYWORDS: Business Intelligence, Customer Analytics, Customer Segmentation, Data Visualization, K-Means Clustering, Machine Learning, Power BI, Predictive Modeling, RFM Analysis, Targeted Marketing

BLOCKCHAIN-BASED SECURE HEALTHCARE DATA MANAGEMENT SYSTEM

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ABSTRACT : The rapid digitalization of healthcare systems has created significant challenges in data security, privacy, and interoperability. This paper proposes a Blockchain-Based Secure Healthcare Data Management System designed to ensure safe, transparent, and efficient handling of patient information. By integrating blockchain technology with distributed storage mechanisms, the proposed framework enables tamper-proof record keeping and secure data sharing among healthcare providers. Smart contracts are utilized to automate access control and maintain transparency in medical transactions. The system enhances data integrity, prevents unauthorized access, and reduces dependency on centralized servers, thereby minimizing the risk of cyberattacks and data breaches. Furthermore, encryption techniques and decentralized consensus mechanisms improve reliability and trust among stakeholders. The proposed model supports real-time data access while maintaining patient confidentiality and regulatory compliance. This research contributes to building a secure and efficient digital healthcare ecosystem, ensuring improved patient care and system resilience.

KEYWORDS: blockchain, healthcare security, smart contracts, data privacy, decentralized systems.

DTRX – DATA TRANSFORMATION & RESEARCH EXECUTION

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ABSTRACT: DTRX is an interactive machine learning workflow platform designed to simplify the end-to end development of predictive models. The system provides a structured pipeline that guides

users through eight key stages of the machine learning lifecycle: dataset upload, data inspection , data cleaning, exploratory data analysis (EDA), feature engineering, target variable selection with automatic problem-type detection, model training, and performance evaluation.

The platform supports CSV-based tabular datasets and integrates automated preprocessing techniques such as duplicate removal, special character sanitization, and intelligent handling of missing values using median imputation for numerical attributes and mode imputation for categorical attributes. The feature engineering module supports categorical encoding through Label Encoding and One-Hot Encoding, dimensionality reduction using Principal Component Analysis (PCA), and the creation of interaction features. Based on the selected target variable, the system automatically identifies whether the task is classification or regression and activates suitable algorithms accordingly. Classification models include Logistic Regression, Decision Tree, and Random Forest, while regression tasks support Linear Regression, Decision Tree Regressor, and Random Forest Regressor. Model performance is evaluated using Accuracy for classification and R^2 Score for regression.

By integrating automation, transparency, and guided interaction, DTRX bridges the gap between theoretical machine learning concepts and practical implementation, serving as both a rapid prototyping environment and an educational platform for understanding the complete machine learning pipeline.

KEYWORDS-Machine Learning Pipeline, Automated Data Preprocessing, Feature Engineering, Exploratory Data Analysis (EDA), Classification, Regression, AutoML Platforms.

GRAPH-DOMINATED COMPUTING: A SURVEY OF TOPOLOGICAL APPROACHES FOR NEXT-GENERATION DIGITAL SYSTEM DESIGN

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ABSTRACT : The increasing complexity of modern digital systems, from multi-core processors to Networks-on-Chip (NoCs), demands robust theoretical frameworks for design, analysis, and optimization. This article explores the synergistic relationship between graph theory and computer organization, arguing that graph-theoretic concepts, particularly those involving structural domination and mapping, are becoming foundational to digital system innovation. We review classical applications, such as Boolean function minimization and state machine representation. Subsequently, we delve into advanced and emerging paradigms, including the hardware mapping of algorithms onto reconfigurable architectures (e.g., honeycomb FPGAs), the use of Prüfer sequences for lossless circuit-graph encoding, hypergraph-based NoC optimization, and graph-embedding techniques for layout minimization. This survey positions graph theory not merely as a tool for analysis, but as a dominant design principle shaping the future of high-performance, low-power, and specialized digital computer organization.
Keywords: Domination, Digital Principles, Network-on-Chip (NoC), Graph Embedding, Logic Synthesis.

UNDERSTANDING OPTIMIZATION IN MACHINE LEARNING: GRADIENTS, CONVEXITY AND DESCENT ALGORITHMS

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ABSTRACT : Optimization is crucial for improving both learning efficiency and predictive accuracy in machine learning, especially in complex, high-dimensional parameter spaces. This study analyzes key optimization techniques used to minimize prediction error and accelerate convergence toward optimal model parameters. Gradient-based methods such as Gradient Descent, Stochastic Gradient Descent, Momentum, and the Adam optimizer are evaluated alongside population-based metaheuristic approaches, including Genetic Algorithms and Particle Swarm Optimization. These methods are applied to supervised learning models and assessed based on convergence speed, computational efficiency, training stability, robustness against overfitting, and overall prediction reliability. Results indicate that adaptive gradient-based optimizers offer faster convergence and greater stability during training, making them ideal for large-scale learning tasks. Conversely, metaheuristic algorithms excel in exploration, effectively navigating complex search spaces and avoiding local minima. The study also highlights that selecting the appropriate optimization strategy significantly affects model generalization and scalability. Findings suggest that combining gradient-based and metaheuristic approaches in hybrid frameworks can further enhance performance, offering a promising direction for advanced artificial intelligence systems.

KEYWORDS: Optimization, Machine Learning, Gradient Descent, Adam Optimizer, Genetic Algorithm, Particle Swarm Optimization

MANAGEMYSPORT: A SECURE MOBILE SYSTEM FOR MULTI-SPORT CLUB MANAGEMENT AND ATHLETE PERFORMANCE TRACKING

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ABSTRACT : The increasing digital transformation in sports management has created a need for efficient systems to manage athlete data, training activities, and administrative operations. However, many grassroots and small-to-medium sports clubs still rely on manual methods such as paper records, spreadsheets, and fragmented communication tools. These approaches often lead to data inconsistency, administrative inefficiencies, and security risks when handling sensitive athlete information. This work presents **ManageMySport**, a secure cross-platform mobile system designed to support multi-sport club management and athlete performance tracking. The proposed system integrates multiple administrative and performance functions into a centralized platform. Key features include training session management, attendance recording, configurable athlete performance evaluation, financial transaction documentation with automated digital receipt generation, and real-time communication between stakeholders. A configurable performance evaluation module enables coaches to define customized performance metrics suitable for different sports disciplines, allowing flexible assessment of athlete development. The system is developed using Flutter for cross-platform mobile deployment and Firebase cloud services for authentication, database management, and secure data storage. Role-Based Access Control (RBAC), encrypted communication protocols, and cloud synchronization mechanisms are implemented to enhance data security and system reliability. The proposed system aims to reduce administrative workload, improve data organization, strengthen communication among coaches, athletes, and parents, and support data-driven decision-making in sports environments. By providing a centralized and scalable mobile solution, ManageMySport contributes to modernizing sports management practices and improving operational efficiency in multi-sport organizations.

KEYWORDS: Sports Management System, Mobile Application, Athlete Performance Tracking, Multi-Sport Management, Role-Based Access Control

AI CHATBOT FOR AIMST UNIVERSITY ENQUIRIES

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ABSTRACT : This project presents the design and development of an AI-powered chatbot integrated with a network monitoring system using PRTG Network Monitor. Modern organizations rely heavily on stable and secure network infrastructures, making real-time monitoring and rapid incident response essential. While traditional monitoring tools provide dashboards and alerts, they often require technical expertise and manual interpretation of data.

The proposed system enhances network monitoring by incorporating an intelligent chatbot capable of interacting with users through natural language. The chatbot is integrated with PRTG via its API to retrieve real-time network data such as device status, bandwidth utilization, downtime reports, sensor health, and alert notifications. By leveraging Artificial Intelligence and Natural Language Processing (NLP), the chatbot can interpret user queries, generate meaningful insights, and provide immediate responses without requiring direct access to the monitoring dashboard.

The system architecture consists of three main components: the PRTG monitoring server, the AI chatbot engine, and a user interface platform (web or messaging interface). The chatbot processes user input, converts it into structured API requests, retrieves relevant monitoring data from PRTG, and presents summarized results in a user-friendly format. Additionally, the system can provide predictive insights, basic troubleshooting suggestions, and automated alert summaries to improve operational efficiency.

The implementation of this AI chatbot improves accessibility, reduces response time to network issues, and minimizes dependency on specialized IT personnel for routine monitoring tasks. It enhances decision-making by delivering concise, real-time information through conversational interaction.

This project demonstrates how Artificial Intelligence can be effectively integrated with network monitoring tools to create smarter, more responsive IT infrastructure management systems, contributing to improved reliability, efficiency, and user experience.

KEYWORD: AI, Chatbot, Network Monitoring, PRTG

TRAFFIC PREDICTION AT PENANG BRIDGE

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ABSTRACT : Traffic congestion remains a significant urban mobility challenge in Malaysia, particularly on the Penang Bridge, a critical transportation corridor connecting Penang Island and the mainland. Increasing vehicle demand, peak-hour directional flow, weather variability, public holidays, and unexpected incidents contribute to dynamic and nonlinear congestion patterns that are difficult to predict using conventional reactive systems. This study proposes a localized Traffic Prediction System specifically tailored for the Penang Bridge to enable proactive congestion forecasting. The system integrates historical traffic volume data, meteorological variables, and temporal indicators to model short-term traffic behaviour. A comparative evaluation of statistical, machine learning, and deep learning approaches was conducted, including Linear Regression, ARIMA, Random Forest, Artificial Neural Networks (ANN), Long Short-Term Memory (LSTM), and Gated Recurrent Unit (GRU). Model performance was assessed using Mean Absolute Error (MAE) and Root Mean Square Error (RMSE) to determine the most suitable predictive framework for infrastructure-specific forecasting. The best-performing model was deployed within a Streamlit-based dashboard to visualize historical trends and predicted congestion levels. The proposed framework contributes to infrastructure-focused Intelligent Transportation Systems by enhancing predictive accuracy, supporting data-driven traffic management, and enabling proactive decision-making for commuters and authorities.

KEYWORDS : Traffic Prediction, Penang Bridge, Intelligent Transportation System (ITS), Machine Learning, Deep Learning, Time Series Forecasting, Traffic Conges

AIMST STUDENT MARKETPLACE SYSTEM

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ABSTRACT : The rapid advancement of digital technologies has significantly transformed the way buying and selling activities are conducted in modern communities. In university environments, students frequently engage in second-hand trading of items such as textbooks, electronic devices, laboratory equipment, and hostel necessities. These transactions are commonly carried out through informal communication platforms such as messaging applications or social media groups. However, such platforms are not designed to support structured trading activities, resulting in scattered listings, limited search functionality, a lack of user verification, and inefficient coordination between buyers and sellers.
In this context, a centralized digital marketplace becomes essential to improve the organization and reliability of student trading activities. This work proposes a web-based AIMST Student Marketplace System designed specifically for the AIMST University community. The proposed system enables students to register using institutional email authentication, ensuring that only verified users can access the platform. The system facilitates various marketplace functionalities, including product listing management, search and filtering mechanisms, communication between buyers and sellers, item reservation and status updates, rating features, and reporting functions for inappropriate listings. The proposed system will support organized transaction management by allowing sellers to control the status of their items as available, reserved, or sold. In addition, integrated messaging functionality allows buyers and sellers to communicate directly within the system to coordinate transactions. By providing a structured and institution-restricted digital marketplace, the proposed system aims to improve transaction transparency, enhance user trust, and facilitate efficient second-hand trading within the university environment.

Keywords: Web-based marketplace, student trading platform, institutional authentication, second-hand marketplace, transaction management

RIDESAFE AI : SMART MOTORCYCLE SAFETY & ALERT SYSTEM

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ABSTRACT : In order to expedite institutional inquiries at AIMST University, an Artificial Intelligence (AI) chatbot was developed and put into use. In the past, students and potential candidates have relied on manual communication methods like phone calls and emails, which frequently lead to slow responses and restricted availability after hours. This project presents a 24/7 automated conversational agent that can instantly and accurately provide information on course details, admissions processes, campus amenities, and general university FAQs in order to address these issues.

The chatbot understands user intent and responds with context-aware responses by using machine learning algorithms and Natural Language Processing (NLP). Through the integration of this AI solution into the university's digital infrastructure, the system improves user experience by retrieving information quickly and drastically reducing the administrative burden on staff. Initial findings show that the chatbot can efficiently and accurately handle a large number of concurrent queries. This study shows how AI-driven automation can enhance communication effectiveness and guarantee that vital information is always available to the university community.

KEYWORDS: Artificial Intelligence, AI Chatbot, Natural Language Processing, AIMST University, Automated Enquiries.

AI-CHATBOT FOR NETWORK PERFORMANCE MONITORING SYSTEM USING PRTG

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ABSTRACT : Motorcycles are widely used for daily transportation due to their affordability, fuel efficiency, and ability to navigate congested traffic. However, motorcycle riders remain highly vulnerable to road accidents due to the lack of structural protection and delayed emergency response during crash situations. In many cases, injured riders are unable to contact emergency services immediately, which can significantly increase injury severity and reduce survival chances. This study proposes RideSafe AI, a smart motorcycle safety and emergency alert system that integrates Internet of Things (IoT) technology with machine learning techniques to improve crash detection and emergency response. The system continuously monitors riding behavior using motion sensors, including accelerometers and gyroscopes, together with GPS modules to collect real-time motion and location data. A hybrid detection approach is implemented in which rule-based threshold monitoring first identifies abnormal movement patterns, followed by a supervised machine learning classifier based on the Random Forest algorithm to classify events as normal riding, risky behavior, or crash conditions. When a crash is confirmed, the system automatically sends an emergency alert message containing the rider's GPS location to predefined contacts through a mobile application. The proposed system demonstrates a cost-effective and scalable prototype that combines IoT monitoring, intelligent data analysis, and mobile communication to enhance motorcycle safety. By improving crash detection accuracy and enabling automated emergency alerts, RideSafe AI contributes to the development of smarter transportation safety solutions and helps reduce emergency response delays.

Keywords: Motorcycle safety, Internet of Things (IoT), crash detection, machine learning, Random Forest.

DUAL-KEY ENCRYPTED CLOUD FILE MANAGEMENT SYSTEM UNDER SECURE OUTCOME-DRIVEN ARCHITECTURE

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ABSTRACT : The rapid adoption of cloud storage services has transformed digital data management; however, persistent concerns regarding centralized key control, unauthorized access, and insecure sharing mechanisms continue to undermine data confidentiality and user trust. Existing platforms such as Google Drive, Dropbox, and Microsoft OneDrive primarily rely on server-side encryption models, limiting user ownership of cryptographic keys. This study proposes a Cloud-Based Encrypted File Management System that enhances data security through a dual-key hybrid encryption architecture and enforced secure sharing controls.

The proposed system is developed as a web-based application using Python Flask for backend processing and Firebase for scalable cloud storage and database management. The encryption framework integrates the Advanced Encryption Standard (AES-256) for file encryption and RSA (RSA-2048) for secure key encapsulation. A novel dual-key mechanism is introduced, combining a server-generated AES key with a user-derived key produced through PBKDF2. The final encryption key is generated using an XOR operation, ensuring that neither the server nor the user alone can decrypt stored files.

To further strengthen security, the system incorporates SHA-256 hashing for file integrity verification, time-limited sharing tokens with automatic expiration, revocable access controls, and structured separation of personal and shared libraries. The development follows an Agile six-phase Software Development Life Cycle (SDLC), encompassing planning, analysis, design, implementation, testing, and maintenance. Comprehensive testing validates encryption correctness, secure access enforcement, and performance efficiency, achieving optimized upload and download operations for files up to 50MB.

This study demonstrates that integrating user-controlled dual-key encryption with enforced sharing policies significantly reduces single-point-of-failure risks in cloud storage environments. The proposed architecture contributes a secure, scalable, and user-centric framework suitable for privacy-sensitive academic and enterprise applications.

KEYWORDS: Cloud storage security, Dual-key encryption, AES-256, RSA-2048, Secure file sharing, Hybrid cryptography

AIMST CLINIC SYSTEM

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ABSTRACT : The AIMST Clinic System is a web-based healthcare management system developed to digitalize and improve the operations of the AIMST University clinic. The existing clinic workflow relies on manual and paper-based processes, resulting in slow patient registration, inefficient appointment scheduling, billing errors, risk of data loss, and limited data security. This project aims to address these issues by providing a centralized and automated clinic management platform. The system integrates key modules including patient registration, appointment management, electronic medical records, diagnosis and prescription handling, pharmacy inventory control, billing, and payment processing. It is developed using the Waterfall Software Development Life Cycle (SDLC) model to ensure a structured and systematic development approach. The technologies used include PHP, MySQL, HTML, CSS, JavaScript, XAMPP, and Visual Studio Code. The system supports multiple user roles such as administrator, doctor, pharmacist, and patient, with role-based access control to ensure data privacy and security. By replacing manual processes with a digital solution, the AIMST Clinic System enhances efficiency, improves data accuracy, reduces errors, and supports better healthcare service delivery within the university clinic environment.

KEYWORDS : Clinic Management System, Web-Based System, Healthcare Information System, Electronic Medical Records, Appointment Scheduling, Billing System, Pharmacy Management, Role-Based Access Control, Database Management, University Clinic Automation

BAYESIAN INFERENCE AS A MATHEMATICAL FRAMEWORK FOR INTELLIGENT CLASSIFICATION SYSTEMS

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ABSTRACT : Intelligent systems frequently operate under conditions of uncertainty, where decisions must be made despite incomplete or noisy data. This presentation argues that Bayesian probability provides a mathematically grounded framework for rational decision-making in such environments. By introducing the principles of conditional probability and Bayes' theorem, the discussion explains how prior beliefs can be systematically updated when new evidence becomes available. The presentation then examines the application of this framework in machine learning classification, focusing on the Naïve Bayes model as a case study. Through the example of spam mail filtering, it demonstrates how probabilistic reasoning and feature-based data representation enable automated systems to compute posterior probabilities and assign class labels effectively. Although the model relies on a simplifying independence assumption, its computational efficiency and interpretability make it widely applicable in real-world domains. Overall, this work highlights Bayesian inference as a foundational component of computational intelligence, illustrating how uncertainty can be transformed into structured and reliable prediction.

Keywords: Bayesian inference, Bayes' theorem, Naïve Bayes model, machine learning classification, probabilistic modelling

AI-ENABLED PILOT FATIGUE DETECTION SYSTEM USING IOT CAMERA SENSORS WITH COCKPIT BUZZER ALERT AND GROUND CREW MOBILE APP

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ABSTRACT : Pilot fatigue is recognized as a significant human-factor issue in aviation safety, as it can impair attention, reaction time, and decision-making abilities during flight operations. Long flight durations, irregular schedules, and high workload may contribute to reduced alertness among pilots, potentially increasing the risk of human error. Traditional fatigue management approaches mainly rely on duty time regulations and self-assessment methods, which do not provide continuous monitoring during flight. Therefore, there is a need for an automated system capable of detecting fatigue in real time and providing timely alerts.

This work presents an AI-Enabled Pilot Fatigue Detection System using IoT Camera Sensors that continuously monitors pilot eye behavior to detect signs of fatigue. The proposed system utilizes an ESP32-CAM module to capture facial images and applies computer vision techniques to analyze eye-closure behavior using the PERCLOS (Percentage of Eye Closure) metric. The fatigue level is determined by evaluating eye closure duration and comparing it with predefined threshold values. When fatigue is detected, an audible buzzer alert is activated inside the cockpit to immediately warn the pilot. At the same time, fatigue information is transmitted to a cloud platform, enabling remote monitoring through a mobile application for ground crew.

The proposed system adopts a non-intrusive and cost-effective approach, eliminating the need for wearable sensors or complex physiological monitoring equipment. By integrating Artificial Intelligence, IoT technology, and cloud communication, the proposed system provides real-time monitoring, automated decision-making, and rapid alert generation. This work demonstrates how intelligent monitoring systems can enhance aviation safety by enabling early detection of pilot fatigue and improving situational awareness for both cockpit and ground operations.

KEYWORDS: Pilot Fatigue Detection, Artificial Intelligence, Internet of Things, PERCLOS, Computer Vision

HYBRID SMART PARCEL AND LOGISTICS MANAGEMENT SYSTEM FOR UNIVERSITY CAMPUS ENVIRONMENT

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ABSTRACT : The rapid growth of e-commerce has significantly increased the number of parcels delivered to university campuses. At AIMST University, parcel handling at the Student Affairs Division (SAD) is currently managed using manual procedures such as logbooks and visual verification of student identification cards. This traditional approach leads to several operational challenges including long waiting times, high staff workload, record inaccuracies, and weak identity verification mechanisms. In addition, the absence of automated notification systems often causes delays in parcel collection and inefficient parcel storage management.

To address these issues, this project proposes the development of a **Hybrid Smart Parcel and Logistics Management System**, a web-based platform designed to automate parcel registration, tracking, and secure collection within the university environment. The system integrates **QR/barcode scanning for parcel identification, fingerprint biometric authentication for secure student verification, and automated SMS notification for real-time communication with parcel owners**. The proposed solution is developed using **PHP for backend processing, MySQL for database management, and standard web technologies such as HTML, CSS, and JavaScript for the user interface**, operating under a **client–server architecture**. The system development follows the **Agile Software Development Life Cycle (SDLC)** to enable iterative design, continuous testing, and progressive system refinement.

The proposed system is expected to significantly improve operational efficiency, reduce human errors in parcel record management, and enhance the security of parcel collection through biometric verification. In addition, the integration of automated SMS notifications provides timely parcel arrival and collection updates to students, improving service quality and user satisfaction. Ultimately, the system contributes to the advancement of **smart campus logistics management** by demonstrating how integrated digital technologies can modernize administrative services within higher education institutions.

KEYWORDS: Smart Parcel Management System, Biometric Authentication, Smart Campus Logistics, QR/Barcode Tracking, SMS Notification System, Web-Based Information System, Agile Development.

AIMSTIME: A UNIVERSITY-SPECIFIC ACADEMIC SCHEDULING SYSTEM INTEGRATING RULE-BASED DEADLINE RISK ESTIMATION AND MOOD-AWARE BEHAVIORAL SUPPORT

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ABSTRACT : Effective time management is essential for academic engagement, performance, and student well-being. However, many digital planner applications lack features tailored to university contexts, such as structured academic scheduling and transparent deadline risk estimation. As a result, students often experience poor organization, missed deadlines, and increased academic stress. This study presents AIMSTime, an academic scheduling system designed to support university students in managing their academic tasks effectively.

AIMSTime was developed using the Software Development Life Cycle (SDLC) to ensure systematic design and implementation. The system provides structured academic task management and employs a rule-based model to categorize deadlines as Safe, Warning, or High Risk. Developed in Kotlin using Android Studio, the application utilizes Room (SQLite) for secure local storage and offline functionality. By integrating deadline risk estimation and mood-aware support features absent in conventional planner applications, AIMSTime addresses the organizational challenges faced by university students.

Grounded in Self-Regulated Learning (SRL) and Cognitive Load Theory, AIMSTime incorporates weekly productivity reflection, adaptive reminders, and mood logging to support planning, monitoring, and reflective academic behaviors. Through structured SDLC development and student-centered usability evaluation, AIMSTime demonstrates the potential of theory-driven scheduling systems to improve planning efficiency, enhance academic organization, and reduce academic stress among university students.

KEYWORDS: Academic Scheduling, Deadline Risk Estimation, Self-Regulated Learning, Cognitive Load Theory, Android Application

DIGITAL CAFETERIA MANAGEMENT SYSTEM FOR AIMST UNIVERSITY HOSTEL STUDENTS

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ABSTRACT : The hostel cafeteria at AIMST University currently manages daily meal operations using manual attendance records, verbal menu communication, and paper-based reporting. These practices lead to inaccurate meal tracking, increased food wastage, and administrative inefficiencies.

This project proposes the development of a Digital Cafeteria Management System (DCMS) to automate attendance tracking and streamline cafeteria operations for hostel students entitled to three daily meals under their accommodation package. The system adopts a three-tier architecture consisting of a cross-platform mobile and web interface, a backend application server, and a centralized cloud-based database to ensure real-time data synchronization and secure information management. Core functionalities include institutional credential-based authentication, QR code–based meal verification, digital menu access, real-time announcements, and automated report generation for administrative analysis.

The system is developed using the Agile Software Development Life Cycle to support iterative refinement through stakeholder feedback. System testing and validation are conducted to evaluate functional performance, usability, and data accuracy. By replacing manual processes with a centralized digital platform, the proposed system aims to reduce human errors in attendance recording, minimize food wastage, improve transparency of meal entitlements, and provide administrators with accurate consumption data to support operational planning within the university hostel environment.

KEYWORDS: Digital Cafeteria Management System, QR Code Authentication, Three-Tier Architecture, Cloud Database, Agile Software Development, Attendance Automation, Food Waste Reduction

AIMST UNIVERSITY LOST & FOUND.

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ABSTRACT : The management of lost and found items at AIMST University currently relies heavily on decentralized, manual methods such as physical notice boards and unstructured social media posts. This fragmentation causes severe operational delays, low item recovery rates, and significant security risks due to a lack of secure verification for claimants. To resolve these inefficiencies, this project proposes "AIMST Connect," a centralized, cross-platform mobile application developed using the Flutter framework, a RESTful API, and a MySQL relational database. The proposed system introduces a smart matching algorithm designed to automatically correlate lost and found data, alongside secure user authentication linked to university Student IDs to prevent fraudulent claims. Furthermore, to overcome the lack of user motivation in traditional crowdsourcing, the application integrates a structural gamification engine that rewards finders with Experience Points (XP) redeemable at a campus loot shop. Guided by the Agile Software Development Life Cycle, this digital transformation aims to significantly reduce the time and stress associated with lost belongings, streamline security administration, and serve as an optimized smart campus model for higher educational institutions.

KEYWORDS : Lost and Found System, Smart Campus, Mobile Application, Gamification, Smart Matching Algorithm, Flutter Framework, Agile Development.

ROOM BOOKING & FACILITY MANAGEMENT SYSTEM FOR FECT LECTURERS

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ABSTRACT : This project focuses on the development of a Room Booking and Facility Management System for lecturers in the Faculty of Engineering and Computer Technology (FECT) at AIMST University. At present, room booking and facility coordination are handled manually, resulting in frequent scheduling conflicts, inefficient use of rooms, and unnecessary administrative burdens on lecturers. These inefficiencies not only waste valuable academic time but also disrupt lesson preparation and undermine the quality of teaching delivery.

The proposed system provides a centralized, web-based platform for lecturers to check room availability, make bookings, and request required facilities. Unlike existing systems that mainly focus on room reservations, this system also includes facility management and feedback features. This makes it more practical for academic use by reducing scheduling conflicts and improving overall efficiency.

The system will be developed using the Waterfall SDLC to ensure a structured process from planning to maintenance. It will be tested for reliability, usability, and effectiveness in reducing booking conflicts and improving communication. Overall, the system aims to simplify administration, optimize resource usage, and provide a well-managed, conflict-free teaching environment.

KEYWORDS: Room Booking System, Facility Management, Web-Based Platform, Scheduling Conflicts, Resource Optimization, Waterfall SDLC.

DENTAL MATE: A SMART DENTISTRY APPLICATION WITH AI MEMORY AND AUTOMATED CLINIC MANAGEMENT

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ABSTRACT : The digital transformation of healthcare systems has become essential to improve service efficiency, accuracy, and patient satisfaction. Dental clinics often handle large volumes of patient records, appointment scheduling, and inventory management, which are commonly managed through manual or semi digital systems. These traditional approaches may lead to data redundancy, scheduling conflicts, inefficient workflows, and increased administrative workload for clinic staff. To address these challenges, this project proposes DentalMate, a smart dentistry clinic management application integrated with Artificial Intelligence (AI) and cloud technologies.

DentalMate is designed as a cross platform mobile and web application that automates key clinic operations, including patient registration, appointment scheduling, dentist schedule management, and inventory monitoring. The system also integrates an AI-powered chatbot capable of assisting both patients and clinic staff by answering queries, retrieving relevant clinic information, and improving communication efficiency. A Retrieval-Augmented Generation (RAG) memory system is incorporated to enhance the AI assistant by enabling context-aware and personalized responses based on clinic data such as appointment history, operating hours, and inventory information.

By combining cloud computing, automation, and intelligent data retrieval, DentalMate reduces manual administrative tasks while improving operational accuracy and accessibility of information. The proposed system aims to enhance clinic productivity, minimize operational errors, and support the ongoing digital transformation in healthcare management.

KEYWORDS: Dental Clinic Management System; Artificial Intelligence (AI); Retrieval-Augmented Generation (RAG); Healthcare Application; AI Chatbot; Cloud-Based System; Appointment Scheduling.

SNAPVAULT+: SMART EXPENSE & RECEIPT MANAGEMENT SYSTEM (PWA)

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ABSTRACT : In the modern digital era, individuals perform numerous financial transactions daily, yet many struggle to manage the resulting accumulation of physical receipts that are prone to fading, tearing, or being misplaced. Traditional expense tracking methods rely heavily on manual recording, which is often inconvenient, prone to human error, and frequently leads to the abandonment of financial tracking altogether. This work introduces SnapVault+, an intelligent Progressive Web Application (PWA) designed to automate the transition from physical documentation to digital accounting. The proposed system utilizes Optical Character Recognition (OCR) via the Google Cloud Vision API to automatically extract merchant names, dates, and total amounts from receipt images. To reduce manual user effort, an integrated Machine Learning (ML) classification model—leveraging algorithms such as Support Vector Machines (SVM) or Naive Bayes—analyzes the extracted text to predict and assign the most appropriate expense categories. Furthermore, the proposed system addresses data redundancy through a specialized duplicate detection layer that employs image hashing and metadata cross-referencing to ensure financial records remain accurate and unique. Developed with a React.js frontend and a Firebase-backed Node.js environment, the proposed system offers a lightweight, secure, and offline-resilient solution tailored for Malaysian university students and small-scale entrepreneurs. By combining automated data capture with interactive visual analytics, this work empowers users to better understand their spending patterns and make informed financial decisions.

KEYWORDS: Progressive Web Application (PWA), Optical Character Recognition (OCR), Machine Learning, Expense Management, Duplicate Detection

DESIGN AND DEVELOPMENT OF A WEB-BASED BOUTIQUE MANAGEMENT SYSTEM WITH RULE-BASED COORDINATED OUTFIT FILTERING,

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ABSTRACT : The rapid growth of e-commerce has transformed the fashion retail industry, encouraging small and medium-sized boutiques to adopt structured digital platforms to enhance efficiency and customer experience. However, many ethnic fashion boutiques continue to rely on informal social media channels for product promotion and order management. Although these platforms provide visibility, they lack structured product categorization, automated inventory tracking, centralized order processing, and coordinated outfit recommendation features. This often results in manual errors, delayed customer responses, inaccurate stock updates, and operational inefficiencies, particularly during peak seasons such as weddings and festive celebrations.

This study presents the design and development of Boutique Desi Royale, a web-based boutique management system developed to address these limitations. The system adopts a Business-to-Consumer (B2C) e-commerce model and integrates structured product categories including sarees, lehengas, kurtis, and accessories. Occasion-based collections such as Wedding, Festival, and Engagement are incorporated to improve thematic browsing. A rule-based coordinated outfit filtering mechanism is implemented to suggest complementary products based on selected occasion types and color preferences. Unlike machine learning-based recommendation systems, this approach utilizes predefined logical rules suitable for academic prototype development.

The project follows the Waterfall Software Development Life Cycle (SDLC) and is developed using HTML, CSS, JavaScript, PHP, and MySQL within a client–server architecture. Core modules include user authentication, product and category management, shopping cart and checkout functionality, order processing, and automated inventory updates. The proposed system enhances operational efficiency, improves inventory accuracy, and provides a structured and personalized shopping experience for boutique customers.

KEYWORDS: Web-Based Boutique System, B2C E-Commerce, Rule-Based Filtering, Inventory Management, Waterfall SDLC

WEARABLE AUDIO EFFECT PROCESSOR WITH PALM SWITCH

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ABSTRACT : Audio effect processors used by musicians, especially electric guitar players, often called "effect pedals", are used to give the sound of the instrument more characters, by adding effects onto the clean audio signals. Commonly used effects include distortion, equalizer, reverb and others. The conventional design of the processors is called "pedals" because they are put on the floor and controlled using footswitches.

This proposed system aims to produce a device to be worn on the guitar player's arm and has a switch placed in the middle of the player's palm, to allow the player to turn certain effects on or off quickly while playing. The device plans to feature 3 effects, namely distortion, equalizer and reverb by applying digital signal processing (DSP) using a microcontroller.

KEYWORDS: Digital Signal Processing, Music, Electric Guitar, Arduino

PERSONAL FINANCE TRACKER

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ABSTRACT : In the era of digitalization, most of the physical activities like learning, meeting and transaction can be done via online. Gen Z, a group of people who are born in between 1997 to 2012 which are now age of 13 to 28, are all born in the year where the global start to shaped by digital technology. They are digital savvy compared to other generation. They prefer digital payment method and Buy Now Pay Later (BNPL). However, Gen Z usually show more financial flaw than other generation. Overspending and financial stress often become the problem faced by major Gen Z individual. Digital payment and BNPL is the main culprit contribute to their financial issues. Those methods cause the loss of "Pain of Paying", decreasing the connection of Gen Z with their money. Gen Z feel unlimited money in their wallet which leads to overspending habit. Although existing financial apps provide features to solve the issue, those apps have their own problem such as pricy, steep learning curve and mistake in auto categorization which can make the problem worsen. Therefore, this project aims to develop a beginner-friendly financial tracker app to solve the issues. The application utilizes 50/30/20 rules to build for easy learning and build solid foundation to Gen Z on their financial management. In addition, chart visualization of money and simple monthly financial report features will be included to increase their awareness on their money flow.

KEYWORDS : Gen Z, Buy Now Pay Later (BNPL), "Pain of Paying", Overspending, Digital Savvy, Financial Literacy, Financial Apps, Manual, Automation, 50/30/20 Rules

WEB-BASED LEARNING PLATFORM FOR AIMST UNIVERSITY

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ABSTRACT : Year 1 Computer Science students often face difficulties mastering technical subjects due to abstract concepts and limited opportunities for continuous practice. Many existing web-based learning systems rely on internet connectivity and focus primarily on grading rather than long-term mastery tracking. This study proposes a standalone local web-based learning platform designed to support continuous self-assessment and topic mastery monitoring across multiple Computer Science subjects for Year 1. The system integrates tutorial lessons in both word and video form, structured quizzes with objective quiz-based assessments, including Multiple Choice Questions and True/False formats. A cumulative mastery calculation mechanism then automatically updates topic performance after each quiz attempt. The platform is developed using the Software Development Life Cycle methodology and implemented within a local server environment using PHP and MySQL, eliminating internet dependency. The proposed system aims to provide immediate feedback, structured practice, and progressive mastery tracking to enhance independent learning in technical education.

KEYWORDS : Web-Based Learning, Offline Learning Platform, Topic Mastery Tracking, Quiz-Based Assessment, Computer Science Education

DEEP LSTM-BASED PREDICTIVE QOS OPTIMIZATION APPROACH FOR INTEGRATED WSN–IOT SYSTEMS

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ABSTRACT : The convergence of wireless sensor networks and Internet of Things (IoT) infrastructures has significantly expanded the scope of real-time monitoring and intelligent automation applications. Despite these advancements, maintaining stable Quality of Service (QoS) in integrated WSN–IoT environments remains a critical challenge due to limited node energy, dynamic traffic variations, fluctuating link conditions and heterogeneous service requirements. Conventional approaches predominantly rely on reactive resource management techniques that respond to performance degradation only after it occurs, resulting in reduced network efficiency and shortened operational lifetime. This paper presents a Deep Long Short-Term Memory (LSTM)-based predictive QoS optimization framework designed to enable proactive performance management in integrated WSN–IoT systems. The proposed model learns temporal correlations among key network attributes, including residual energy, traffic intensity, node density, link quality, latency and packet delivery behaviour. A composite QoS index is formulated by jointly considering packet delivery ratio, throughput, latency, and energy efficiency. The trained LSTM network predicts future QoS conditions, allowing early detection of potential degradation. Based on the predicted state, a multi-objective optimization module dynamically adjusts clustering decisions, routing paths, transmission power levels and bandwidth allocation to maintain service stability. Extensive simulations demonstrate that the proposed framework improves network lifetime by 28%, enhances packet delivery ratio by 16%, increases throughput by 19%, reduces latency by 21%, and decreases overall energy consumption by 24% compared with conventional static and reactive protocols. The proposed approach establishes an intelligent, scalable and energy-aware solution for next-generation WSN–IoT systems.

KEYWORDS: Long Short-Term Memory, Quality of Service, Multi-Objective Optimization, Predictive Resource Allocation and Latency.

WEB-BASED ATTENDANCE MANAGEMENT SYSTEM

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ABSTRACT : This project is about the development of a Web-Based Attendance Management System that will modernize and ensure the security of the tracking of student participation in higher education. Conventional manual systems, including paper sign-in sheets, and other localized spreadsheets are becoming unacceptable because they are prone to human error and proxy attendance, and can be overly cumbersome to large classes. The proposed solution for this project is as follows: an automated, multi-tenant digital system that combines role-based access control with dual-layer verification would largely help improve the quality of data and the efficiency of operations. The system is based on the Spring Boot framework and MySQL and has been implemented to replace the slow manual roll calls with fast digital check-ins, which are provided using time-limited six-digit codes, QR code scanning, and location validation by IP. These will make sure the students are physically present in campus and this will help eliminate the most prevalent problem of proxy marking. The system is not only a record keeping system but also offers real-time student, lecturer and administrator dashboards to promote an open academic environment. The implication of this research is that adopting such centralized, network-authenticated systems not only reimburse the valuable instructional time but also offers the institutions high-fidelity data analytics that is vital in academic auditing and accreditation as well as proactive support of students. This is a digital revolution that is a scaling and cost efficient change towards more responsible and technologically comprehensive academic management.

KEYWORD : Attendance Management System, Web-Based Application, Higher Education, Student Engagement , QR Code Scanning, IP-Based Validation