



Department of Research and Development

2026 International Conference

on

**Emerging Trends in Mobile Computing
and Sustainable Informatics**

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ICEMCSI

Proceedings

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ABOUT CONFERENCE

New Horizon College of Engineering in India is hosting the 2026 International Conference on Emerging Trends in Mobile Computing and Sustainable Informatics (ICEMCSI) sponsored by IEEE and technical co-sponsored by IEEE Bangalore Section, IEEE Power Electronics Society Bangalore Chapter, IEEE Industrial Electronics Society Bangalore Chapter. The ICEMCSI is scheduled on June 17th and 18th 2026. Plenary talks, Paper Presentation and Keynote Address by distinguished researchers and technologists, as well as contributed papers from academicians and industry professionals, will be featured at the conference. The ICEMCSI is a global platform for technologists, researchers, business leaders, and industry leaders to share their perspectives on emerging technologies and newer solutions that can guide and lead to a better tomorrow. The papers are presented in offline mode by the authors. All accepted and presented papers will be submitted for the inclusion in IEEE XPLORE, subject to meeting IEEE Xplore's scope and quality requirements.

ABOUT NHCE

New Horizon College of Engineering is an Autonomous College permanently affiliated to Visvesvaraya Technological University (VTU), approved by the All-India Council for Technical Education (AICTE) and University Grants Commission (UGC). It is accredited by NAAC with 'A' Grade and has a National Board of Accreditation (NBA). New Horizon College of Engineering is located at the heart of the IT capital of India, Bangalore. NHCE provides an environment which is conducive for intellectual growth. The infrastructure acts as a facilitator for the effective delivery of the curriculum. NHCE boasts of state-of-the-art facilities for its students. The institute places top-most priority on innovative programs that include both traditional classroom theory and professional skills training. There is a strong impetus on overall personality development of the students with emphasis on soft skills.

OBJECTIVES

The International Conference brings together researchers, practitioners, and students to discuss and share their experiences, new ideas, and research results on all aspects. The conference has significantly contributed to address the unprecedented research advances in the areas of mobile computing and sustainable informatics. ICEMCSI is dedicated to explore the cutting-edge applications of mobile computing and sustainable informatics to enhance the future of mobile applications.

PREAMBLE

ICEMCSI serves as a forum for researchers to address mobile networks, computing models, algorithms, sustainable models, and advanced informatics that supports the symbiosis of mobile computing and sustainable informatics.

Message from Hon'ble Chairman, NHEI



It is heartening to note that New Horizon College of Engineering is organizing the "International Conference on Emerging Trends in Mobile Computing and Sustainable Informatics (ICEMCSI 2026)" on 17th and 18th June 2026. This conference is technically sponsored by IEEE and technically co-sponsored by the IEEE Bangalore Section, IEEE Power Electronics Society Bangalore Section Chapter, and IEEE Industrial Electronics Society Bangalore Section Chapter.

I am confident that the plenary sessions and research presentations by esteemed academicians and industry professionals will provide significant value to all participants. Furthermore, the interactive sessions are expected to greatly enhance knowledge and foster meaningful discussions in the domains of Mobile Computing and Sustainable Informatics.

I take this opportunity to congratulate the ICEMCSI Organizing team for their exemplary teamwork, coordination, and dedication in organizing this prestigious international conference and making it a truly enriching learning experience.

I extend my best wishes to ICEMCSI Organizing team of NHCE for the grand success of this mega event.

Dr. Mohan Manghnani

Chairman

New Horizon Educational Institution, Bengaluru

Message from President, NHEI



On behalf of the organizing committee, I am honoured to invite eminent professors, young researchers, and students from across the globe to the "International Conference on Emerging Trends in Mobile Computing and Sustainable Informatics (ICEMCSI 2026)", scheduled to be held on 17th and 18th June 2026.

ICEMCSI 2026 serves as a global platform for technologists, academicians, researchers, and students to exchange ideas and share their perspectives on emerging technologies and innovative solutions that contribute to a better and sustainable future. This two-day international conference brings together experts from academia and research to discuss recent advancements, present novel findings, and deliberate on key developments in the fields of mobile computing and sustainable informatics.

I eagerly look forward to an engaging and enriching interaction with distinguished academicians and researchers from India and abroad, fostering the exchange of innovative ideas and impactful research outcomes. I am confident that this conference will offer valuable insights and contribute significantly to advancements in engineering and technology.

I extend my best wishes to the organizing committee of ICEMCSI 2026 and wish the conference a grand success.

Mr. Dharmesh Manghnani

President

New Horizon Educational Institution, Bengaluru

Message from the Vice Chancellor, VTU



On behalf of the organizing committee, I am honoured to invite eminent professors, young researchers, and students from across the globe to the "International Conference on Emerging Trends in Mobile Computing and Sustainable Informatics (ICEMCSI 2026)", scheduled to be held on 17th and 18th June 2026 at New Horizon College of Engineering, Bengaluru. This conference is technically sponsored by IEEE and technically co-sponsored by the IEEE Bangalore Section, IEEE Power Electronics Society Bangalore Section Chapter, and IEEE Industrial Electronics Society Bangalore Section Chapter.

ICEMCSI 2026 serves as a global platform for technologists, academicians, researchers, and students to exchange ideas and share their perspectives on emerging technologies and innovative solutions that contribute to a better and sustainable future. This two-day international conference brings together experts from academia and research to discuss recent advancements, present novel findings, and deliberate on key developments in the fields of mobile computing and sustainable informatics.

I eagerly look forward to engaging and enriching interactions with distinguished academicians and researchers from India and abroad, fostering the exchange of innovative ideas and impactful research outcomes. I am confident that this conference will offer valuable insights and contribute significantly to advancements in engineering and technology.

I extend my best wishes to the organizing committee of ICEMCSI 2026 and wish the conference a grand success.

Dr. Vidyashankar S

Vice Chancellor

Visvesvaraya Technological University, Belagavi

Message from Principal, NHCE



I am delighted to note that New Horizon College of Engineering is organizing the two-day “International Conference on Emerging Trends in Mobile Computing and Sustainable Informatics (ICEMCSI 2026)” on 17th and 18th June 2026. The conference is technically sponsored by IEEE and technically co-sponsored by the IEEE Bangalore Section, IEEE Power Electronics Society Bangalore Section Chapter, and IEEE Industrial Electronics Society Bangalore Section Chapter.

This international conference, focusing on mobile computing and sustainable informatics, will provide an excellent platform for researchers, practitioners, and students to come together and share their knowledge, experiences, and innovative ideas across diverse domains of research, engineering, science, and technology.

I extend my heartfelt congratulations to the ICEMCSI team for their relentless efforts, dedication, and commitment in organizing this conference and making it a grand success.

I convey my best wishes to the entire ICEMCSI team for the continued success of this two-day international conference.

Dr. Manjunatha
Principal, NHCE

Message from Dean Academics, NHCE



It gives me immense pleasure to note that New Horizon College of Engineering is organizing the two-day “International Conference on Emerging Trends in Mobile Computing and Sustainable Informatics (ICEMCSI 2026)” on 17th and 18th June 2026, with technical sponsorship from IEEE and technical co-sponsorship from the IEEE Bangalore Section, IEEE Power Electronics Society Bangalore Section Chapter, and IEEE Industrial Electronics Society Bangalore Section Chapter.

ICEMCSI 2026 provides an excellent academic platform for scholars, researchers, and students to engage in meaningful discussions on emerging trends and innovative developments in the fields of mobile computing and sustainable informatics. Such conferences play a vital role in bridging the gap between theoretical knowledge and practical applications, fostering research collaborations, and encouraging the dissemination of high-quality research outcomes.

I am confident that the conference will inspire participants to explore new ideas, exchange knowledge, and contribute to advancements in engineering and technology and also congratulate the organizing committee for their dedicated efforts in planning and executing this prestigious event, and I extend my best wishes for the grand success of ICEMCSI 2026.

The overwhelming response through papers from across the world has proven the growing thirst for knowledge.

I congratulate all those who are involved directly and indirectly with ICEMCSI 2026 and wish the conference great success.

Dr. R. J. Anandhi

Professor & Dean - Academics

Message from Dean R&D, NHCE



On behalf of the organizing committee, I am delighted to invite eminent academicians, young researchers, and students from across the globe to the 2026 International Conference on Emerging Trends in Mobile Computing and Sustainable Informatics (ICEMCSI), scheduled to be held on 17th and 18th June 2026.

ICEMCSI 2026 serves as a vibrant platform that brings together researchers, practitioners, and students to exchange ideas, share experiences, and present innovative research findings in the fields of mobile computing and sustainable informatics. The conference aims to address emerging challenges and showcase cutting-edge advancements that contribute significantly to the evolving landscape of these domains. It is also dedicated to exploring transformative applications that will shape the future of mobile technologies and sustainable solutions.

As Dean - Research, I extend my heartfelt wishes to the organizing committee for their dedicated efforts in organizing this prestigious event. I am confident that ICEMCSI 2026 will be a highly successful and enriching experience for all participants.

Dr. Revathi V

Professor & Dean - R&D
Organizing Chair ICEMCSI 2026

Message from the Chair 2027

IEEE Bangalore Section



It gives me immense pleasure to extend my warm greetings and best wishes to the organizers, researchers, academicians, industry professionals, and students participating in the 2026 International Conference on Emerging Trends in Mobile Computing and Sustainable Informatics - ICEMCSI 2026, organized by New Horizon College of Engineering, Bengaluru which has consistently demonstrated excellence in technical education, research, and innovation, and I appreciate their continued efforts in creating meaningful platforms that foster knowledge exchange and collaborative research. I am also delighted that this conference is sponsored by IEEE and technically co-sponsored by the IEEE Bangalore Section, IEEE Power Electronics Society Bangalore Chapter, and IEEE Industrial Electronics Society Bangalore Chapter.

In today's rapidly evolving digital landscape, the convergence of mobile computing, intelligent systems, AI-driven informatics, and sustainable technologies is redefining how societies, industries, and economies function. Conferences such as ICEMCSI play a pivotal role in bringing together researchers, practitioners, innovators, and young minds to deliberate on emerging technologies and explore solutions that can contribute toward a smarter, more connected, and sustainable future. The theme and focus areas of ICEMCSI 2026 are highly relevant and aligned with global technological priorities and national missions toward digital transformation, sustainability, resilient infrastructure, and intelligent ecosystems. I am confident that the plenary talks, keynote sessions, and technical paper presentations will stimulate insightful discussions, encourage interdisciplinary collaborations, and inspire impactful innovations. As the IEEE Bangalore Section celebrates its Golden Jubilee milestone, we remain committed to advancing technology for humanity by strengthening industry-academia collaboration, nurturing research ecosystems, and enabling platforms that empower the next generation of technology leaders.

I congratulate the organizing committee, faculty members, volunteers, reviewers, and all stakeholders for their dedicated efforts in organizing this prestigious international conference. I wish ICEMCSI 2026 a grand success and hope all participants have a rewarding and enriching experience.

Sincerely,

Dr. Chengappa Munjandira

Chair 2027 – IEEE Bangalore Section

Vice Chair – Industry Relations, IEEE India Council

Past-Chair, IEEE SIGHT Bangalore Section

Technical Lead – IEEE MOVE Outreach India Program

Message from the Chair of IEEE PELS Bangalore Section Chapter



On behalf of the IEEE Power Electronics Society (PELS) Bangalore Section Chapter it is an honor to welcome you to ICEMCSI 2026 organized by New Horizon College of Engineering, Bengaluru.

In an era defined by rapid digital growth, the fusion of mobile computing and sustainable informatics is vital. Our chapter is proud to technically co-sponsor this event alongside the IEEE Bangalore Section and the IEEE Industrial Electronics Society (IES) Bangalore Section Chapter. As technical sponsors of IEEE, we are committed to upholding the highest standards of innovation and academic excellence.

At PELS, we focus on efficient energy conversion—a cornerstone for sustainable mobile technologies. We are excited to see how your research addresses the challenges of power management and green computing.

I look forward to the impactful discussions and breakthroughs that will emerge on 17th & 18th June 2026. Join us in shaping a smarter, more sustainable future.

Dr. Prema V

Chair: IEEE Power Electronics Society Bangalore Section Chapter

Vice Chair: IEEE Industrial Electronics Society Bangalore Section Chapter

Message from the Chair of IEEE IES Bangalore Section Chapter



On behalf of the IEEE Industrial Electronics Society (IES) Bangalore Section Chapter, it is my privilege and honor to welcome you to the 2026 International Conference on Emerging Trends in Mobile Computing and Sustainable Informatics (ICEMCSI 2026) organized by New Horizon College of Engineering, Bengaluru. We are delighted to technically co-sponsor this prestigious conference in association with the IEEE Bangalore Section and the IEEE Power Electronics Society (PELS) Bangalore Section Chapter. Through this collaboration, we reaffirm our commitment to promoting innovation, interdisciplinary research, and academic excellence.

The IEEE IES Bangalore Section Chapter actively supports advancements in intelligent industrial systems, automation, embedded technologies, and sustainable electronic solutions that drive the future of smart and connected ecosystems. ICEMCSI 2026 provides an excellent platform for researchers, academicians, industry professionals, and students to exchange ideas, present pioneering research, and foster meaningful collaborations.

I am confident that the conference proceedings and technical discussions scheduled on 17th & 18th June 2026 will inspire innovative solutions and contribute significantly toward building a smarter, greener, and technologically empowered society.

I extend my best wishes to all the participants, authors, organizers, and delegates for the grand success of ICEMCSI 2026.

Dr. Vishal Anand A G

Chair of IEEE Industrial Electronics Society Bangalore Section Chapter
Director of Engineering, Bloom Energy (I) Pvt Ltd, Bengaluru, Karnataka, India

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KEYNOTE SPEAKERS



Dr. Vijanth Sagayan Asirvadam

Chair & Associate Professor, UTP Malaysia

Lecture Title

Dynamic Programming for Camera Placement and Drone Path Planning using Mobile Computing

Abstract

"Efficient surveillance and monitoring in dynamic environments require optimal camera placement and intelligent drone navigation strategies. This work presents a Dynamic Programming (DP)-based framework for optimizing camera placement and drone path planning in smart monitoring systems. The framework leverages mobile computing paradigms to distribute computation across edge devices, enabling low-latency processing and scalability in large-scale environments..."



Avinash M

Project Director, U R Rao Satellite Centre (URSC)

Lecture Title

Systems Engineering Enabled Solutions for Sustainable Informatics in Satellite Systems

Abstract

"Modern satellite systems are evolving into software-defined, autonomous information infrastructures operating under extreme resource constraints. Sustainability in space systems must be redefined as the ability to generate, process, transmit, and preserve high-value information using minimal energy, bandwidth, and hardware. This presentation covers Sustainable Informatics as a holistic design philosophy for future Satellite systems, introducing futuristic technologies like Edge Computing, AI, and Predictive fault management."



Dr. Hitesh Datt Mathur

Professor & Head (SIRE), BITS Pilani

Lecture Title

**Digital Intelligence for Sustainable Energy Systems:
Convergence of AI, IoT and Smart Grids**

Abstract

"The rapid growth of renewable energy is transforming conventional power systems into intelligent energy networks. Advances in AI, IoT, and data analytics are enabling real-time monitoring and optimization of energy infrastructures. This session explores the convergence of digital technologies with modern power systems, highlighting intelligent energy management frameworks that integrate renewable sources, battery storage, and electric mobility to address grid stability and climate change."



Dr. S. N. Deepa

Associate Professor & Associate Dean, NIT Calicut

Lecture Title

**Artificial Intelligence Framework for Sustainable
Informatics in Smart Ecosystems**

Abstract

"This keynote presents a comprehensive Artificial Intelligence (AI) framework designed to enable sustainable informatics within smart ecosystems. The framework leverages machine learning, deep learning, and edge intelligence to optimize resource utilization and enhance energy efficiency across diverse applications including smart cities and industrial automation. It incorporates explainable AI and ethical considerations to ensure transparency and robustness in dynamic environments."

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Paper ID: ICEMCSI2026-140

Automated Vehicle Accident Detection and Alert System Using GSM and GPS Technology

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Abstract - This paper discusses the design of an automatic vehicles crash detection and alarm system meant to enhance road safety and improve emergency response. The system consists of a microcontroller with GPS, GSM module, and an accelerometer that monitors the movement of a vehicles and detects sudden slowing down or bump typical of an accident. On detection of an anomaly, the system will automatically transmit the accident location to emergency services via SMS for immediate response. Reliability, real-time performance, and ease of integration of communication modules and hardware are the main design drivers. Experimental results demonstrate the effectiveness of the system in accurately identifying accidents and informing authorities in real time, and it is able to significantly reduce emergency response times and improve road safety outcomes.

Keywords - Vehicle Accident Detection, Emergency Alert System, GPS and GSM system, Accelerometer Sensor, Real-Time Monitoring, Automated Alert System.

Model Predictive Control (MPC) Based Multi-Output DC to DC Converter for Electric Vehicle Applications

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Abstract - Single Input Multi-output DC-DC buck converter introduces a powered with a static DC input and the Converter switching is driven by the help of Model Predictive Control (MPC) which is capable of charging four different batteries of varying capacities through independent circuits. MPC predicts system states to dynamically adjust duty cycles, enhancing Quick response and the regulation precision over traditional method like (PI controller) where It is Compared to traditional PI control, MPC delivers Quick response with faster adaptability and reducing the overshoot during load changes. The design shift coupled outputs to isolated paths, improving independence and adaptability for EV battery charging which leads to preventing of cross-regulation and High voltage regulation.

Keywords - MPC (Modal predictive Control), PI Controller, Cross Regulation, Buck Converter, Voltage Regulation, Fast Transient Response.

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Adaptive Document Rectification and Illumination Normalization via Hybrid Cascade Detection

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Abstract - Smartphone photography has become a common substitute for flatbed scanners and yet the images captured in uncontrolled settings often suffer from geometric skew, shadows, uneven illumination, and cluttered backgrounds. While the transformer based rectification models effectively address these degradations, their computational demands limit real time mobile deployment. The traditional edge driven techniques offer efficiency but struggle in low contrast or noisy environments. This work introduces a training free document scanning pipeline built on classical computer vision operations, centered around a Hybrid Cascade Detection strategy. The system prioritizes edge and contour based boundary localization when gradient information is reliable and transitions to chromatic saturation segmentation when structural cues prove insufficient. Perspective correction employs planar homography estimation refined with a safety shrink adjustment to minimize border artifacts. Illumination normalization combines division based background compensation, percentile guided contrast stretching, and non local means denoising to produce uniform outputs with enhanced text clarity. Evaluation on 16 test images captured under varied conditions demonstrates a 100% document detection success rate, with the hybrid cascade reliably localizing document boundaries without resorting to full image fallback. The full pipeline executes in an average of 3.13 seconds per image on a standard laptop CPU without GPU acceleration. The deterministic pipeline ensures reproducible behavior across varied conditions, while its modular architecture facilitates the adaptation to specialized document types and future integration with a lightweight learned components.

Keywords - Computer vision, document rectification, hybrid cascade, image restoration, OpenCV, shadow removal.

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Behavior-Aware Framework for Account and Deposit Recommendation Using LSTM-Based Sequence Modeling and Retrieval-Augmented Explanations

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Abstract - Customers in retail banking tend to persevere with account types that grow to be incongruent with their changing financial usage; it causes an inefficient use of accounts and missed savings prospects. The existing methods of recommendation mostly use snapshots of short-term transactions or fixed eligibility policies, which are not able to reflect long-term changes in behavior around income stabilization and consistency in surplus, and changes in liquidity requirements. The paper suggests the Behavior-Aware LSTM-Based Recommendation Framework with Retrieval-Augmented Explanations, which is intended to recommend account upgrades and deposit products together, through the modeling of long-term financial behavioral sequences. The frameworks model between eighteen to twenty four months of transactions history with a multi-layer Long Short-Term Memory Network to follow temporal trends in the regularity of income, balance development, surplus stability, and use of cash. As there are no publicly available datasets, that are currently available to perform the addressed task, a realistic synthetic dataset is constructed, which contains both coherent behavioral relationships and heuristic ground-truth labels. Testing shows a high level of empirical performance with Top-1 accuracies of 92% and 94%, and Top-2 accuracies of 97.67% and 99.33% respectively on account upgrade and deposit recommendation tasks, indicating that the framework has stable, interpretable and behaviorally consistent recommendations that can be deployed in regulated retail banking.

Keywords - Behavior-aware recommendation, financial behavior modeling, account recommendation, deposit recommendation, long-term transaction sequences, LSTM, retrieval- augmented explanation.

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An Efficient Image Preprocessing Framework for Accurate Segmentation and Classification of Pneumonia from Lung Images

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Abstract - Evaluation of parenchymal changes and lung disease, such as pneumonia, greatly relies on the quality of the input medical images. In this paper, we introduce a novel robust image processing method to be used as a first stage in pneumonia detection systems. The proposed method caters to the general image degradation with a model-based approach by considering a mean-filtered salt-and-pepper noise as degradations and by use of median filtering to attenuate the impulsive noise and preserving some important lung details. In order to introduce some consistency to the various data sets, the filtered images are also for resized via aspect-ratio-preserving scaling. The dynamic range is normalized to improve numerical stability for analysis by segmentation and classification algorithms. Then, contrast normalization is used to increase the visibility of the lung fields and the abnormal shadows. As a consequence, the processed images can be employed to achieve better visual consistency and quality for more accurate lung segmentation and more robust pneumococcal classification based on the machine learning and deep learning models, respectively.

Keywords - Pneumonia Detection, Lung Image Preprocessing, Median Filtering, Image Normalization, Medical Image Segmentation, Disease Classification.

Paper ID: ICEMCSI2026-517

A Multilingual Content to Speech Implementation Translation using OCR, NLP, Organisations and Text-To-Speech Deep Learning Models

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Abstract - The increasing globalization of digital content demands communication systems that transcend language and modality barriers. This paper presents a robust multilingual image-to-speech conversion framework that integrates Optical Character Recognition (OCR), Natural Language Processing (NLP), and Text-to-Speech (TTS) synthesis—all powered by deep learning. The proposed pipeline first extracts textual content from printed or handwritten document images captured via mobile cameras. Extracted text undergoes preprocessing, tokenization, and automatic language identification. A transformer-based multilingual NLP module performs context-aware translation, semantic enrichment, and grammar correction. Finally, a neural TTS vocoder generates expressive, human-like speech. The framework is optimized for low-latency inference on mobile and IoT devices through quantization and TensorFlow Lite deployment, achieving end-to-end latency under 500ms on a Pixel6 smartphone with a total model footprint of only 34MB. Extensive experiments on a newly assembled multilingual dataset (English, Hindi, Tamil, Arabic)—released publicly to facilitate further research—demonstrate state-of-the-art performance: OCR Character Error Rate (CER) of 2.8% (printed) and 5.4% (handwritten), translation BLEU score of 36.2, and speech Mean Opinion Score (MOS) of 4.3, significantly outperforming traditional modular baselines. Potential applications include assistive technology for the visually impaired, multilingual education, and global tourism. Future work will incorporate emotional prosody, augmented reality interfaces, and support for additional low-resource languages.

Keywords - Multimodal communication, OCR, neural machine translation, text-to-speech, deep learning, accessibility, multilingual processing, edge deployment.

Paper ID: ICEMCSI2026-522

A Multimodal Context-Aware AI Conversational Agent for Emotion Recognition and Adaptive Stress Management

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Abstract - With advances made recently in Artificial Intelligence that have allowed Conversational Agents to deliver personalized emotional support via multimodal interaction, a Conversational Agent has been created based on Artificial Intelligence Technology, that uses Textual, Acoustic and Visual information to provide personalized Stress Management intervention(s) using Contextual Intelligence and Adaptive Stress Management Intervention(s). This system applies a Multimodal Deep Learning (DML) framework (Convolutional Model (CNN) in conjunction with Sequential Model (LSTM)) to provide real-time Emotion Recognition across 5 classes of emotions. Real-world, peer-reviewed experimental evaluation proves that the results demonstrate an Emotion Recognition Accuracy of 93.6% with Multimodal DML. In comparison with CNN-only methods (86.4%), LSTM-based methods (88.9%) and Transformer-based methods (90.2%), it has demonstrated superior performance in Emotion Recognition accuracy (93.6%). The incorporation of Contextual Intelligence within the Multimodal DML has resulted in an average increase in Response Relevant Ratings from 3.2 to 4.6 on a 5-point Likert scale (an increase of 43.7%). Delivery of Personalized Stress Management Strategies results in a User Satisfaction of 94.2%, exceeding the satisfaction achieved using Static Methods of Intervention. Longitudinal studies conducted over a number of interactions have shown an average stress reduction from 4.5 to 2.3, indicating Long-term Emotional Adaptation. It is evident from the research that the proposed Conversational Agent incorporates Multimodal perception, Contextual Reasoning and Adaptive Feedback mechanisms to deliver reliable and empathetic Emotional Support. As such it represents a potentially viable solution for Implementation in a Real World Mental Health and Artificial Intelligence contexts.

Keywords - Conversational Agent, Multimodal Emotion Recognition, Context-Aware Systems, Stress Management, Deep Learning, Human-Computer Interaction, Mental Health Support.

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MilletGAI: An LLM for the Indian Millet Ecosystem

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Abstract - India, as the world's largest producer of millets, faces significant challenges in disseminating accurate information about millet cultivation, nutrition and processing. Generative AI assistants based on Large Language Models (LLMs) are a promising solution. Foundational LLMs suffer from hallucination and outdated knowledge, leading to unreliable responses for domain-specific agricultural queries. To address these issues, this paper proposes MilletsGAI, an AI-driven knowledge assistant that combines Retrieval-Augmented Generation (RAG) with a fine-tuned Meta Llama-3-8B-Instruct model for accurate and grounded millet information generation. MilletsGAI is targeted to use by all the stakeholders of the Indian millet ecosystem: farmers, researchers, food processing units, nutritionists, chefs and general public. The system employs a two-phase training approach: Supervised Fine-Tuning (SFT) on 5,000+ millet-specific Q-A pairs followed by Direct Preference Optimization (DPO) for response alignment. A ChromaDB vector database with 500+ indexed documents enables semantic search using the all-MiniLM-L6-v2 embedding model. The hybrid approach provides context-aware responses with verifiable source citations. A web-based frontend built with Next.js provides interactive access to the system. Comparative evaluation demonstrates the RAG-enhanced fine-tuned model achieves significantly superior performance with a BLEU-4 score of 0.3657 and ROUGE-L of 0.6495, compared to the base Llama-3 model (BLEU-4: 0.0168, ROUGE-L: 0.0981) and fine-tuned model without RAG (BLEU-4: 0.0198, ROUGE-L: 0.1367). The system successfully addresses hallucination while maintaining conversational quality for agricultural domain expertise.

Keywords - Millets, Large Language Models, Fine Tuning, Retrieval Augmented Generation, Agricultural AI, Virtual Assistant.

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Triagebot: A Resource-Efficient AI Model for Symptom-Driven Clinical Triage in Healthcare Systems

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Abstract - Digital health technology has developed at a fast pace which has increased the need for automated triage systems that provide patient support before doctors see them. However, current online symptom checkers rely on either rigid decision trees that cannot accommodate linguistic variety or cloud-based huge language models that introduce delay and expense, as well as the risk of receiving hallucinated medical advice. This paper presents Triagebot, a lightweight clinical triage framework that combines a deterministic rule-based reasoning engine with a compact, offline LLM to enhance the accuracy and reliability of a system. Users interact through a structured, drop-down-driven chat interface that assures standardized symptom acquisition, hence reducing ambiguity and input noise. The high-confidence symptom-disease mapping is performed using a rule-based engine, whereas the LLM operates as a fallback when rule coverage is poor. The system evaluates its performance through testing on 1200 clinical cases which include both high-confidence and ambiguous symptom combinations. The experimental results show that the hybrid method developed by the researchers achieves 91.8% accuracy and 91.4% F1-score which outperforms both rule-based and LLM-based benchmark systems while requiring less time to process information. Finally, the system assigns patients to an appropriate specialist and schedules the nearest available appointment, offering a full end-to-end triage pipeline suitable for hospital integration. The results show that hybrid reasoning systems create an optimal balance between easy-to-understand results and flexible language use which makes Triagebot an effective system that provides clinical decision support while requiring fewer resources.

Keywords - Medical triage, hybrid AI, rule-based reasoning, language model, healthcare chatbot, clinical decision support, hospital informatics.

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MELO-NET: Melanoma Disease Classification using Deep Learning- based Feature Pyramid Network

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Abstract - Melanoma is one of the most common types of cancer that can have a high mortality rate if not detected early. Early and accurate detection is vital to reduce mortality and improve treatment outcomes. However, existing methods often struggle with limited feature representation, high inter-class similarity, and poor robustness against noisy dermoscopic images leading to reduced diagnostic accuracy. To overcome these challenges, a novel MELO-NET is introduced for melanoma disease detection. The input dermoscopic images from the ISIC 2020 dataset are preprocessed using an Adaptive Trilateral Filter (ATF), which enhances image quality by preserving lesion boundaries while effectively reducing noise in high-gradient regions. Feature Pyramid Network (FPN) is used to extract rich multi-scale representations, combining local fine-grained lesion details with global contextual features. Residual Multilayer Perceptron (ResMLP) is utilized to improve gradient flow and enhance discriminative power, enabling precise division into two classes: benign and malignant. The effectiveness of MELO-NET is validated using performance metrics such as recall, precision, specificity, accuracy, and F1-score. The MELO-NET approach achieves an overall accuracy of 98.96%, and F1 score of 98.11%. The MELO-NET approach improves an overall accuracy by 5.20%, 7.40%, and 2.67% better than VGG16, ResNet, and MLP respectively.

Keywords - Melanoma disease, dermoscopic images, Adaptive Trilateral Filter, Feature Pyramid Network, Residual Multilayer Perceptron.

Paper ID: ICEMCSI2026-561

QoS-Aware Federated Deep Reinforcement Learning for 6G Cell-Free Network Slicing

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Abstract - 6G network has been rendered heterogeneous which again requires greater intelligence and privacy of the network slicing. This paper proposes a Federated Deep Reinforcement Learning (FL-DRL) system to be adopted so that slice orchestration can be adapted to cell free 6G systems. The provided system executes a number of edge agents that on local level learn to assign resources to heterogeneous services enhanced Mobile Broadband (eMBB), Ultra-Reliable Low Latency Communication (URLLC), and massive Machine Type Communication (mMTC) and a global aggregator performs federated averaging to synchronize models without sharing raw data. QoS aware reward is employed concomitantly to optimize the throughput, latency and reliability in order to realize service level agreement (SLA) in accordance with the slice. The proposed FL DRL scheme has been simulated to stabilize convergence, can approach optimal resource utilization, and fairness in performance across slices and is better than the adaptability and convergence stability of the both the adaptive and centralized baselines.

Keywords - 6G, Cell-Free Networks, Network Slicing, Federated Learning, Deep Reinforcement Learning, Edge Intelligence, QoS Optimization, Resource Allocation.

Paper ID: ICEMCSI2026-573

Multi-Sensor Based Automatic Food Authenticity Detection System

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Abstract - This paper presents a novel multi-sensor approach for real-time classification of food items into natural and hybrid categories, addressing the growing need for consumers to identify food authenticity in an era of increasing food processing and adulteration. The proposed system integrates four complementary sensors with an Arduino UNO microcontroller: a pH sensor to detect acidity changes from processing, a turbidity sensor to measure particle clarity and texture uniformity, an MQ-135 gas sensor to identify volatile organic compounds (VOCs) from preservatives and additives, and a DS18B20 temperature sensor for baseline environmental data. A rule-based classification algorithm with weighted sensor fusion analyzes the data to categorize food samples with confidence scoring, placing 40% weight on VOC detection, 35% on pH, and 25% on turbidity. Testing on 10 diverse food samples demonstrated an overall classification accuracy of 85% with confidence levels ranging from 75% to 95.9%, successfully distinguishing between fresh fruits and minimally processed items. The low-cost (\$50-80) portable system enables rapid food authenticity verification in just 15-30 seconds per sample without laboratory testing. It is noted that the current dataset is limited to 10 samples as a proof-of-concept validation, and accurate operation requires sensor calibration prerequisites, including a 24-48 hour MQ-135 warm-up period and pH sensor calibration with standard buffer solutions.

Keywords - Food authenticity, multi-sensor system, Food classification, VOC detection.

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Breast Cancer Classification Aided by Homomorphic Encryption

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Abstract - In sensitive fields like healthcare, machine learning adoption is limited by privacy and security concerns. Federated Learning (FL) exposes vulnerabilities through inference attacks on model updates, whereas centralized approaches run the risk of data breaches. For detecting breast cancer, this paper presents a privacy-preserving framework that combines FL with CKKS homomorphic encryption. Hospitals can employ our strategy to locally train logistic regression models, encrypt weight updates with CKKS, and aggregate them without decryption. The system, which was implemented with PyTorch and OpenFHE, maintains data confidentiality throughout and achieves accuracy of 80% on the Wisconsin Breast Cancer Dataset. The framework ensures compliance with HIPAA and GDPR regulations while introducing only 22% less computational overhead than plain FL. Encryption efficiency will be the primary focus of future research, as will data distributions outside of IID.

Keywords - Federated Learning, Homomorphic Encryption, CKKS Scheme, Logistic Regression, Privacy-Preserving AI, Breast Cancer Detection, HIPAA Compliance.

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SustainFlow: AI-Driven Behavioral Evolution for Sustainability

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Abstract - In the evolving era of Artificial Intelligence (AI) and mobile technologies, imagine your smartphone as a personal sustainability coach that tracks your carbon footprint in real time, scans the gadget and shows its energy consumption and nudges you toward greener choices. This contribution presents an AI-powered mobile application that advances sustainable informatics through emerging mobile computing paradigms. Targeting UN SDGs 7, 12, and 13, the application is based on the Double Diamond design process and informed by stakeholder research, literature review, and interviews with more than 100 users. An AI gadget scanner uses smartphone sensors and geolocation to analyse air quality, step counts, travel carbon footprints, and device energy consumption in real time. Personalised activity tracking, update suggestions, and AI-based rooftop renewable potential evaluation are among the main features.

Keywords - Artificial Intelligence (AI), Energy Consumption, Smart Energy, Renewable Energy Adoption, Sustainability.

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Emotion Recognition in Chatbot using Multimodal AI

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Abstract - The recognition of emotion that enables scientists to involve it in the conversation agents enhances the aspect of human-computer interaction as the conversational agents become empathetic. In this paper, the reviewer proposes a multimodal emotion recognition system of chatbot together with speech, text, and face as a combination of the deep learning architecture. CNN-BiLSTM appears to handle speech attributes such as Mel-spectrograms, whereas textual data is treated with the assistance of a BERT-based transformer model. These modalities are combined to form emotion inference accuracy using an attention fuelled fusion mechanism. The experimental studies of benchmark data indicate that multimodal fusion mode is highly useful in contextual interpretation of emotions and good results can be achieved in real time during interaction between chatbot. The proposed system will also get the sphere of affective computing closer to more natural and emotionally intelligent communication.

Keywords - Emotion Recognition, Chatbot, AI.

High-Fidelity GNSS Integrity Monitoring for Tactical Aircraft: A Multi-Sensor Fusion Framework with ISAC-Augmented Terrestrial Anchors

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Abstract - Tactical airplanes that work in a hostile atmosphere demand an extraordinary level of integrity and toughness in the navigation systems. The presented paper suggests a multi-sensor fusion system that provides high-fidelity GNSS integrity monitoring of stealth and sixth-generation ranges. The system closely integrates GNSS and IMU system with radar sensor, EO/IR cameras, barometric and air-data system, as well as terrain-referenced navigation. One of the innovations is the application of Integrated Sensing and Communication (ISAC) terrestrial anchors in providing both radar and navigation communication waveforms to increase the level of navigation robustness. We describe the integrity attacks on tactical aviation, jamming, spoofing, multipath attacks, and aerodynamic attacks, and demonstrate the effects of fused sensor data and ISAC anchors on these problems. The paper has given a summary of the waveform design of ISAC, channel estimation, radar-communication co-design, and the intrinsic anti-jam and anti-spoof capability. The fusion framework involves powerful algorithms like extended/unscented Kalman filtering, factor graph optimization and particle filtering using the concept of integrity risk modeling by RAIM, ARAIM and SBAS. Fighter dynamics of 6-DOF of fighter, and sensor models were implemented in a high-fidelity simulation environment using MATLAB/Simulink, STK, and ns-3. The simulation outcome shows that the suggested structure maintains the accuracy and integrity of navigation in harsh conditions of GNSS degradation and enables real-time fault errors detection and supports almost the highest requirements of the military technological activities in which safety is the primary concern.

Keywords - GNSS integrity, tactical aircraft, multi-sensor fusion, ISAC, RAIM, terrain-referenced navigation, sensor fusion algorithms, anti-jamming.

Evaluating Single-Task and Multi-Task Deep Learning Models for Binary Risk Classification of Diabetic Retinopathy and Macular Edema

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Abstract - Early detection of diabetic retinopathy (DR) and diabetic macular edema (DME) is the central element of preventing the loss of visual functions and being able to offer patients timely and clinical response. Although deep learning techniques have proven to be very effectual in the analysis of retinal images, most studies have addressed such conditions separately, and there is little that has been done to compare the performance of multitask and task-focused methodology to learning with regard to its ability to predict the probability of occurrence of retinal diseases. The article is a controlled experiment which evaluates the ability of three deep learning models to predict binary risk of DR and DME using fundus pictures: a multitask model predicting both types of diseases and two single-task models, one disease at a time. The processing pipelines and optimization settings used to train all the models are trained with the IDRiD Dataset. Performance is determined in terms of F1-score, AUC-ROC Accuracy, and Cohen Kappa. The results provide empirical evidence on the trade-offs between shared representation learning in multitask networks and specialized learning in single-task models, which is further appended as a framework of systematic comparison towards the development of sound automated systems of retinal disease screening.

Keywords - Medical Image Analysis, Diabetic Retinopathy, Multi-task Deep Learning, EfficientNet, Diabetic Macular Edema.

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Mobile IoT Enabled Multistage Diabetic Foot Ulcer Assessment Using Detection, Segmentation, and Explainable Deep Learning

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Abstract - Diabetic Foot Ulcer (DFU) is a serious complication affecting diabetes patients which leads to infection and gangrene and amputation if doctors do not detect it early. The standard clinical evaluation process becomes difficult to use because it requires expensive expert assessment and people lack access to trained professionals which affects individuals living in rural areas. The research presents a smartphone-based Internet of Things system which uses interpretable deep learning technology to perform automatic diabetic foot ulcer assessments and determine their severity levels. The proposed system includes three components which enable clinicians to identify ulcer locations and assess wound size and determine patient condition according to Wagner Classification medical assessment system. The main classifier uses an EfficientNet-based convolutional neural network while the system incorporates explainable artificial intelligence methods to enhance clinical trustworthiness. The research team conducted their first framework test through a binary ulcer classification experiment which used DFU patch images to assess model performance according to its fundamental design. The system uses Streamlit to create a remote monitoring system which enables users to operate devices through their smartphones. The research results show that the proposed method works successfully while creating a basis for complete multilevel DFU evaluation which will be applied within Internet of Things medical systems. Novelty of the proposed system is attributed to the combination of mobile IoT data gathering, explainable deep learning, and hybrid clinical rule-based severity analysis.

Keywords - Diabetic Foot Ulcer, IoT Healthcare, EfficientNet, Explainable AI, Medical Image Analysis, Remote Monitoring.

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DeepFlood: Streamlining Urban Flood Evaluation with Web-Based Deployment and Customizing Deep Learning Frameworks

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Abstract - To be genuine typical flood monitoring systems perform well in adequate weather climates. Visual telescopes become blind when you actually needed, when the atmosphere is clogged with rainstorm and pathway is being saturated with rainwater. They are typically complicated cameras, and digital cameras consume light. This project is inspired by that vital visibility void. The optical process has to be entirely discarded. We applied Synthetic Aperture Radar (SAR) instead. SAR breaks through air clutter to view the earth below, without regard to cloud cover or pitch blackness, unlike its optical equivalents. The drawback with information from radar, however, is that it is scattered. It's accumulation of signals reflects back that need critical consideration, not an image. We didn't blindly chunk the data at an algorithm to figure out disaster. Employing a balanced dataset of 2,000 radar images We created a Convolutional Neural Network (CNN) and trained it. Radar snapshots are noisy, with full of "speckle" and urban clutter that looks evokes like water. Before the system could dependably discriminate among flooded roadway and a damp rooftop, we had to do an extensive cleanup procedure, transforming it to grayscale and strengthening edges. The results are truly encouraging. Our three-layer model obtained an accuracy of 87%. In a vacuum, that could appear like just another statistic, but in this field, that major impact a solid 10% boost over the present operational norms. That's what divides between timely evacuation from false signal. We didn't want this to die in a designated folder on a hard drive, either. We wrapped the model in a Flask web app to prove it could function in the wild, providing real-time classification when it counts. It's not perfect, but it's a working proof that we don't have to be blind during the worst of the storm.

Keywords - Urban Flood Monitoring, Synthetic Aperture Radar (SAR), Custom CNN, Deep Learning, Flask Deployment, Remote Sensing.

Paper ID: ICEMCSI2026-689

Biomedical Signal Based Actuation in Low Cost Prosthetic Arms with Integrated IoT

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Abstract - This work discusses the design and implementation of an inexpensive, IoT-based myoelectric prosthetic arm that translates EMG signals into motor actuation for the prosthetic arm of upper-limb amputees. The system employs surface electrodes that are strategically placed on the amputee's residual limb to acquire EMG signals from the amputee. These signals are amplified, filtered and conditioned before being processed to the ATmega pro microcontroller. These filtered and processed signals into an ATmega2560 Pro microcontroller are reliable and have processing capacity. These signals are converted into PWM outputs based on the signals received to control servo motors for different joint movements such as finger flexion, wrist rotation, and elbow movement. The prosthetic arm developed contains six degree of freedom with high precision. The prosthetic arm is constructed with 3D-printed PLA+ material which is light, ergonomic, and personalized based on the area of lost limb. The implementation of a Battery Management System (BMS) helps with proper current discharge and control over the flow of current throughout the entire circuit, onboard temperature sensors for sensing motor temperature and amputee's temperature, and wireless data transmission enables real-time monitoring of performance and improvements in user safety. Safety measurements include fall detection which is cooperated with a mobile app. Statistical analysis, including PCA and correlation studies, validates the independence and variability of joint movements. The solution illustrates an affordable and functional prosthetic solution with applicability to economically disadvantaged and rural populations as a process innovation. The proposed work had an affordable, scalable and functioning prosthetic solution with high level of potential in deployment in economically low and rural communities.

Keywords - ATmega2560 Pro microcontroller, PCA9685, MG995 servo motors, Battery management system, IoT, 3D Printing, Surface electrodes.

Paper ID: ICEMCSI2026-701

Enhancing B2B Supply Chain Transparency through Blockchain enabled Cryptographic Verification and Predictive Analytics

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Abstract - Today's B2B supply chains are usually so fragmented that risks are only caught after they have already caused disruption. This framework closes that gap by layering private blockchain security over predictive analytics. By anchoring raw shipment data at the source, information is verified as untampered before entering the analytical pipeline. Combining Random Forest with Structural Equation Modeling achieves 92% prediction accuracy. This creates a closed-loop system where every compliance decision is permanently logged, moving supplier management away from reactive firefighting toward a truly proactive process.

Keywords - B2B Supply Chain, Blockchain Traceability, Anomaly Detection, Structural Equation Modeling (SEM), Cryptographic Verification.

CyberSure: AI-Powered Cyber Risk Prediction and Blockchain-Based Insurance Platform

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Abstract - Today, organizations face a growing number of cyber threats, such as phishing attempts, ransomware attacks, data leaks, hacking of credentials, and complex social engineering tactics that disrupt their normal operations and financial health. Traditional insurance options for cyber risk rely on routine questionnaires, manual underwriting, and time-consuming procedures to process claims, which are not well suited for the constantly changing nature of cybersecurity threats. This research presents an integrated platform that uses blockchain and machine learning to devise timely, clear, and efficient cyber insurance services along with claim management. The system employs a group of machine learning models to continuously analyze and evaluate cyber risk on a scale from 0 to 100. It also uses IPFS for secure documentation of insurance policies and claim evidence, and Ethereum-based smart contracts to automate the creation and processing of claims. Testing across different scenarios demonstrated a significant improvement in risk assessment with 92.8% accuracy, a reduction in claim processing time from several days to just a few minutes, increased transparency thanks to secure blockchain records, and reduced fraud by removing weaknesses in manual claim processes. This study addresses key issues in current cyber insurance by combining modern technologies into effective frameworks suitable for large corporations, financial institutions, small and medium-sized businesses, and individual users. The findings contribute meaningfully to discussions on financial technology innovation, trust-building in the insurance industry, and opportunities for technological integration in financial services. **Keywords:** Cyber insurance, cyber risk evaluation, machine learning, blockchain technology, smart contracts, risk measurement, decentralized storage, fraud detection, automation, financial tech innovation, Web3 integration, algorithmic insurance, and threat detection.

Keywords - Cyber insurance, Cyber risk assessment, Machine learning, Blockchain, Smart contracts, Ethereum, IPFS, Automated claims processing, Fraud detection, Risk scoring, Cybersecurity.

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Detection of Arrhythmia based on Electrocardiogram by applying Machine Learning

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Abstract - Arrhythmia is a condition where the heart beats irregularly, either too fast or too slow, and early detection is important for preventing terrible complications such as strokes or cardiac arrest. Traditionally, arrhythmia detection has relied on manual electrocardiogram (ECG) analysis by healthcare professionals, which can be time-consuming and subject to human error. However, machine learning (ML) offers a promising solution to improve the accuracy and speed of arrhythmia detection. We propose a robust system for arrhythmia detection comparison by applying various machine learning algorithms. By evaluating the performance of these models across multiple metrics, we identify the most effective approach for arrhythmia detection. Our experimental results demonstrate the model's effectiveness across metrics for the accuracy and confidence. This study highlights the realizability of machine learning in enhancing arrhythmia detection and bring to improved patient outcomes in cardiovascular care.

Keywords - Arrhythmia Detection, Machine Learning, Electrocardiogram, PCA, Hyper-parameter tuning.

Paper ID: ICEMCSI2026-706

Carbon on the Chain: Digital Solutions for a Greener Planet

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Abstract - The climate crisis demands modern, expedient response systems that reduce greenhouse gas emissions. Traditional carbon Cap-and-trade systems and other credit mechanisms face serious problems, including scams, poor historical performance, delayed corrections, and scale limits. reducing their effectiveness. The Carbon on the Chain project tackles these issues by launching a blockchain-enabled platform that protects and decentralizes carbon credit management. It is Built on the Ethereum blockchain. The system uses ERC-20 tokens to represent carbon credits and ERC-721 NFTs for Registered organizations and unique identity management. An integrated on-chain Monitoring, Reporting, and Verification (MRV) frame- work allows for real-time tamper-proofing, tracking emissions, and storing data with IPFS. Emitters, auditors, and regulatory agencies will interact in a smart contract-driven manner. These workflows automate credit issuance and trading while minimizing manual intervention. By removing centralization, the platform uses cryptographic security to reduce failure points, cut down the expense of administration, and speed up settlement processes. User-friendly dashboards enhance the system. The module architecture is available for organizations of all sizes; it enables the addition of future improvements, such as AI-based analytics. Overall, Carbon on the Chain offers a scalable. clear, and efficient approach to modernizing carbon markets. and advancing global climate action. Although significant progress has been achieved in carbon credit systems, there is still a substantial gap in terms of implementing a completely decentralized, automated, and tamper-free system for MRV. The existing carbon credit systems are not verified in real time, and there is also a lack of integration with digital identity and audit trails. This paper attempts to address these issues by proposing a blockchain-based system for MRV.

Keywords - Blockchain, Carbon Credits, Smart Contracts, Tokenization, Emission Verification, Decentralized MRV.

Paper ID: ICEMCSI2026-708

An Encrypted Biometric Verification Platform with Homomorphic Processing and Webcam Face Analysis

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Abstract - The research presents an Encrypted Biometric Verification Platform which uses webcam-based face recognition together with hybrid homomorphic encryption technology. The system aims to provide secure biometric authentication together with complete user privacy protection throughout all stages of the process. The system uses Partial Homomorphic Encryption through the Paillier method and Fully Homomorphic Encryption through the CKKS method to perform face matching in encrypted form without disclosing biometric information. Deep learning models create facial embeddings which the system processes in encrypted format for secure usage. The model obtained an accuracy of 94.8%, while maintaining a minimal false acceptance rate and an acceptable False Rejection Rate (FRR) according to the experimental findings. The proposed approach ensures strong privacy protection, scalability, and robustness for real-world applications.

Keywords - Biometric authentication, Face recognition, Homomorphic encryption, Insulation conserving, webcam authentication, CKKS encryption secure biometrics.

Paper ID: ICEMCSI2026-712

Intelligent Intrusion Detection System with Secure Logging and AI Chatbot Integration

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Abstract - Current cyber threats remain unaddressable because current Traditional Intrusion Detection Systems (IDS) methods lack sufficient transparent functioning and their digital evidence collection methods produce unreliable results. The research presents an AI-based Security Operations Center (SOC) dashboard which integrates machine learning (ML) and Explainable AI (XAI) with cryptographic log security. The system detects hazardous activities which include DDoS attacks and port scanning and brute-force attacks and uses Flask and Chart.js technology to show its findings. The framework establishes situational awareness through its two components which provide confidence- weighted alerts and XAI explanations that users can easily understand. The system creates forensic integrity through SHA-256 hashing which generates a verifiable audit trail that reveals any unauthorized log modifications through hash mismatches. The experimental results show that the system achieves better detection performance because it decreases false positive errors while improving system reliability during post-incident investigations in enterprise monitoring systems and cyber-ranges and environments that require strict compliance.

Keywords - *Intrusion Detection System (IDS), Security Operations Center (SOC), Machine Learning, Explainable Artificial Intelligence (XAI), Network Traffic Analysis, Cybersecurity, SHA-256 Cryptography, Log Integrity.*

SpotNet-v2: A Hybrid Framework for Individual Leopard Identification using Deep Quadruplet Networks and SIFT Verification

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Abstract - Wildlife monitoring and conservation requires the identification of individual animals in camera trap data by automated means to be scalable. The shortcoming of the traditional classification-based methods is the low generalization to unseen individuals and growing cardinality of classes. We introduce SpotNet-v2, a deep metric learning system, in this work, which is a hybrid system to learn open-set leopard identification. The suggested system incorporates YOLOv8, which is used to achieve strong region-of-interest identification, a ResNet50 backbone to embed discriminatory features, and a quadruplet loss to improve inter-class separability and intra-class tightness. In order to make matching more reliable in difficult conditions like variations of pose, occlusion, etc., a re-ranking of candidate matches using a SIFT-based geometric verification module is added. Experiments on a large-scale camera trap dataset of about 15,000 images of 1,200 individual leopards show that the proposed approach achieves 94.2% Top-1 and 91.0% mean Average Precision (mAP), which is better than the traditional triplet-loss-based models. The importance of each component is confirmed by ablation studies. The framework suggested offers a practical and resilient framework to practical wildlife re-identification systems.

Keywords - Leopard Identification, Metric Learning, Quadruplet Loss, Wildlife Biometrics, YOLOv8, ResNet50, SpotNet-v2, quadruplet, Localization, Likelihood Estimation, Capture History.

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Interactive Web Analytics and AI Insights

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Abstract - This paper presents - 'Interactive Web Analytics and AI Insights', a system made to convert raw data points into natural language for human understanding. Although a tremendous volume of session, interaction, and commerce data is accumulated within an enterprise, the process of converting this raw Telemetry data to inform strategic decision-making has become a bottleneck due to latency and the underlying expertise associated with SQL query analytics in large enterprises. The current work tries to introduce a comprehensive and highly scalable analytics system with a natural language interface. Our solution combines these four kinds of analytics: Traffic, Funnel, Product, and Experiment, and does so under a unified and harmonious architecture. Our solution utilizes Google Cloud Platform and Click House technologies together for handling high- throughput event streaming (up to 5 million per client per month) with (Query latency) lower than a second. The most distinguishing feature of our platform is its use of an AI exploration layer developed on a Model Context Protocol (MCP) Server. This allows querying of data in natural language and automatically detects trends and anomalies. The performance validation has indicated our solution keeps a load time under 2sec for complex queries and scales well for 500 concurrent tenants per client. shows a 90% reduction in query complexity while maintaining sub-second latency for 5M monthly events.

Keywords - Real-Time Analytics, ClickHouse, Large Language Models (LLM), Text-to-SQL, A/B Testing, Model Context Protocol (MCP).

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Building-Integrated Thermal Mass as Support Infrastructure for Sustainable Data Centre Cooling

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Abstract - Data centre cooling is highly energy intensive, with mechanical air-conditioning dominating overall power consumption. This study evaluates the impact of structural thermal mass and thermally activated building systems (TABS) on cooling performance using Energyplus simulations for a prototype data centre in Denver climate conditions. Three scenarios were analyzed: baseline computer room air conditioner (CRAC) operation, enhanced slab thermal mass, and slab-integrated TABS supporting CRAC cooling. Results indicate that increasing thermal mass alone has negligible impact on annual performance, whereas integrating TABS significantly improves system efficiency and stability. Annual power usage effectiveness (PUE) reduced from 1.146 to 1.077 with TABS, while seasonal cooling efficiency increased by 25% during peak summer months. HVAC power demand reductions of up to 30% were observed, along with improved inlet thermal conditions for IT equipment. The findings demonstrate that coupling TABS with conventional air systems enables effective load buffering, reduced mechanical cooling reliance, and improved energy performance in data centres.

Keywords - Data centre cooling, CRAC systems, TABS, EnergyPlus simulation, Sustainable data centres.

Vehicle Speed Estimation and Number Plate Recognition using Image Processing Techniques

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Abstract - This article introduces the Smart Integrated Traffic Enforcement System (SITES), an economical, single-camera approach for automated vehicle speed measurement and Automatic License Plate Recognition (ALPR) employing deep learning and image processing techniques. The system proposed utilizes YOLOv8-small for real-time detection of vehicles across various classes, a virtual reference-line technique for immediate speed estimation, and two OCR engines (EasyOCR and PyTesseract) for extracting text from license plates. The system attains a vehicle detection rate greater than 95% with confidence scores ranging from 0.85 to 0.98, an Average Precision of 0.91, and an error in speed estimation of 3–7%. EasyOCR reached a plate-level recognition accuracy of about 92%, surpassing PyTesseract (85%), especially in diverse lighting conditions and plate angles. The combined pipeline functions at 25–35 frames per second, achieving an end-to-end latency of 300–600 ms, demonstrating real-time practicality. In contrast to traditional multi-camera or radar systems, SITES employs a single HD camera, greatly simplifying hardware requirements and lowering deployment costs while ensuring enforcement-grade precision. The suggested system shows significant promise for intelligent transportation networks, smart city traffic surveillance, and automated law enforcement purposes.

Keywords - YOLOv8, automobile identification, velocity assessment, automatic number plate recognition (ANPR), EasyOCR, PyTesseract, smart transport systems, instantaneous image processing, deep learning, traffic monitoring.

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AI-Powered Vulnerability Management Using GitHub Actions for Secure Software Development

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Abstract - Considering how extensively software applications have come to be used, security is a very big concern in a period like this, and all of this is related especially to the way programming is done nowadays. While several tools exist to look for weaknesses, understanding what those weaknesses are is still quite hard, and so it's difficult for programmers to work out, understand and then correct them. As a result, important security faults can be left in place, and this means a higher chance of them being taken advantage of, and of systems failing. This study aims to solve this problem by creating an automatic, clever system for handling weaknesses in software during the development process. The study details a GitHub process, powered by AI, which puts together looking at what program components depend on, and static code analysis, inside a CI system – using GitHub Actions. This process that's suggested runs security checks on every piece of code added and every request to pull code in and so helps find weaknesses early. As well as that, artificial intelligence is used to summarize complicated security reports into things people can read, which show the weaknesses and suggest how to put them right. Automatic replies are given as comments on pull requests, which helps people talk to each other in real time, and encourages people to write secure code. By bringing together continuous integration, automatic weakness-finding, and clever analysis of security reports, this process allows for solutions to software security problems which can be used on a large scale, and which don't cost much.

Keywords - *GitHub Actions, Vulnerability Detection, Artificial Intelligence, CI Security, DevSecOps, Software Security, Automated Security Testing, Static Code Analysis, Dependency Scanning, Secure Software Development.*

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Real-Time Vision-Based Gesture Control of a Robotic Hand for Medical and Healthcare Applications

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Abstract - This research investigates the integration of computer vision techniques into a robotic hand developed for medical and healthcare applications, including blood collection, medicine dispensing, surgical assistance, and cleaning operations. The robotic hand employs advanced vision-based algorithms to interpret and respond to visual inputs, enabling precise and efficient execution of complex manipulation tasks. Core system components include camera modules for visual perception, machine learning models for object and gesture recognition, and actuators for physical interaction with the environment. The incorporation of computer vision significantly enhances the adaptability of the robotic hand, allowing it to learn from environmental cues, adjust its grasp and motion strategies based on real-time feedback, and collaborate effectively with human operators. The proposed system focuses on the development of a real-time hand gesture recognition framework using MediaPipe and OpenCV. A webcam continuously captures video frames, from which hand landmarks are detected and analyzed to determine finger positions within a predefined region of interest. The extracted finger state information is converted into digital form and transmitted to a Raspberry Pi board via serial communication for subsequent control actions.

Keywords - Robotic Hand, Computer Vision, Hand Gesture Recognition, Medical Robotics, OpenCV, Human-Robot Interaction.

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Real-Time Vision-Based Gesture Control of a Robotic Hand for Medical and Healthcare Applications

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Abstract - The advancement of assistive technologies using deep learning and computer vision is aiding blind persons to navigate their surroundings with more ease and convenience. To detect the obstacles and alert the users, it is recommended to integrate a pair of smart glasses with a camera, Raspberry Pi, voice assistant, and vibration motor. Using CNN, the device is able to transmit sound and vibration concurrently and detect the nearby objects to facilitate the movement of the blind persons safely and efficiently. The purpose of developing such technology is to replace the traditional assistance devices with a portable, cost-effective, and non-intrusive one to enhance the mobility of such persons.

Keywords - Smart Glasses, Assistive Technology, Visually Impaired Navigation, YOLO Object Detection, CNN, Ultrasonic Sensors, Raspberry Pi, Real-Time Obstacle Detection.

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Machine Learning Based Evapotranspiration Estimation: A Systematic Review

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Abstract - Evapotranspiration (ET) is an essential part of the hydrological cycle and a crucial factor in irrigation scheduling, drought monitoring and hydrological modeling as well as research on climate studies. The machine learning (ML) and deep learning (DL) approaches have quickly developed into useful tools for estimation of reference evapotranspiration (ET_0), actual evapotranspiration (ET_a), and crop evapotranspiration (ET_c), especially in situations with limited data and for spatial upscaling using remote sensing. Algorithmic trends, input-variable analysis, validation techniques, performance measures and geographic coverage are all examined in this systematic review. The review identifies best-performing model classes, highlights challenges in generalization and physical consistency, and outlines future research directions toward physics-aware, explainable, and operational ML-based ET products. The review paper describes the future research approaches toward physics-aware, explainable, and functional ML-based ET products and identifies the most accurate ML model for evapotranspiration estimation.

Keywords - Evapotranspiration, machine learning, prediction.

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Detection and Analysis of Timing-Related Faults in Combinational Circuit Using Cadence Tools

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Abstract - The downscaling of technology increases integrated circuit density which was predicted by Moore. Due to the evolution of this deep submicron technology, the designing and fabrication process has become challenging and complex. This project explores the path delay faults and transition delay faults in VLSI circuit by finding out the critical path and implementing different techniques to optimize it. There are mainly 2 types of faults in VLSI circuits based on electrical effects i.e., Stuck-at faults and Delay faults. Delay faults do not affect the logical function but they cause the circuit to behave incorrectly in terms of timing parameter. That is the reason the project mainly focuses on analyzing and optimizing the Transition and Path delay faults. Firstly, the width of PMOS and NMOS are calculated using the drain current equation and the widths are fixed throughout the experiment. Critical path is then computed and optimization techniques like adding buffers and replacing complicated logic gates with universal gates like NAND gate. The tool being used is Cadence Virtuoso to design the schematic and observe the delay in its respective waveform. Later, different methods are implemented in order to optimize the circuit by observing the critical path behavior.

Keywords - path delay fault, transition delay fault, combinational circuit, VLSI, Cadence Virtuoso.

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Accident Possibility Prediction and Safer Route Recommendation Using Deep Learning

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Abstract - Urban road safety is a critical challenge, while most existing navigation systems primarily optimize routes based on travel time or distance without accounting for accident risk under varying environmental and behavioral conditions. This paper presents a reproducible hybrid framework for accident possibility prediction and safer route recommendation. The proposed approach combines efficient and interpretable segment level accident probability estimation using gradient boosting with a graph neural network extension to capture spatial dependencies among connected road segments. Additionally, a lightweight traffic simulation module is incorporated to model time-dependent traffic conditions without reliance on external APIs. The framework integrates open-source road network data, historical accident records, weather information, and derived traffic-related features to model time-varying conditions. Predicted segment-level probabilities are calibrated and transformed into routing costs through a risk-aware formulation, enabling safer route selection while balancing safety and travel efficiency. Experimental evaluation demonstrates improved identification of high-risk segments and better-calibrated probabilities compared to baseline models, along with a significant reduction in predicted accident exposure with only a modest increase in travel time. The proposed framework is scalable, reproducible, and suitable for deployment in data-constrained urban environments.

Keywords - Accident prediction, safer route recommendation, XGBoost, graph neural networks, explainability, OpenStreetMap, risk-aware routing.

Energy-Efficient and Adaptive Autonomous Driving for Electric Vehicles Using Machine Learning

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Abstract - The increasing usage of electric vehicles and ongoing developments in self-driving technology highlight the need for energy- efficient systems that can successfully navigate complicated traffic and busy roads. This paper introduces a novel machine learning (ML) system for Autonomous Electric Vehicles (AEVs) which takes advantage of Imitation Learning through Behavior Cloning, with Reinforcement Learning via Proximal Policy Optimization (PPO). The goal of the ML model is to reduce energy usage while showcasing consistently good navigation performance. The model shows how hard it is to balance using energy and driving correctly in electric vehicles. Using the CARLA simulator as a testing environment, it demonstrates impressive lane keeping capabilities, improved decision making with changing traffic scenarios, and general navigational competency, all while minimizing the battery usage. The proposed method combines imitation learning from humans, with reinforcement learning which makes it possible for Autonomous Electrical vehicles to learn first from expert driving, and then refine their driving performance. The dataset used here is collected from the CARLA environment. Results show that this method is better than traditional strategies and uses less energy. It is also safe. Follows traffic laws and road markings This research helps make self-driving transportation safe and sustainable. It also lays the groundwork for using energy- electric vehicles in real life. The goal is to make self-driving vehicles that are both safe and good, for the environment.

Keywords - Autonomous Electrical Vehicles, Imitation Learning, Reinforcement Learning, Proximal Policy Optimization, CARLA Simulator.

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Blockchain based Decentralized Authentication Modelling Scheme in Edge and IoT Environment

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Abstract - Information systems subject to failures and external attacks, as well as internal misconduct, are significantly compromised due to the conventional one-way authentication approach. The integration of blockchain to improve authentication processes alongside edge computing and the “Internet of Things (IoT)” is a viable concept. The paper presents BlockAuth, a decentralized authentication solution utilizing blockchain technology, specifically tailored for edge and IoT computing applications. BlockAuth regards each edge device as a node within a blockchain network. This enhances the system's security, reliability, and capacity to rectify mistakes. The proposed schemes encompass safe registration and authentication procedures, a decentralized authentication protocol utilizing blockchain technology, and the implementation of blockchain consensus processes and smart contracts. Through comprehensive investigation and assessment, BlockAuth demonstrates its capacity to deliver superior security configuration management and dependable authentication. The scheme supports numerous authentication schemes such as password schemes, certificate schemes, biometric schemes, and token schemes, depending on the high security needs of the edge and IoT systems.

Keywords - Blockchain, decentralized authentication, IoT security, edge computing, smart contracts, elliptic curve cryptography, BlockAuth.

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Real-Time Traffic Signal Optimization using Quantum Computing and IoT

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Abstract - Traffic jams are an issue in cities that are growing really fast. Traffic jams make our travel time longer. They also make us use gas and pollute the air more. The problem of traffic jams is really bad, in these cities. Traffic jams are something that we have to deal with every day in these growing cities. Traffic signal systems that use fixed or semi-adaptive timings often don't work when traffic flow changes quickly. Traffic congestion is really affecting the environment and the people in growing cities because of the increased travel times due, to traffic congestion. Conventional traffic signal control systems, which use fixed or semi-adaptive timing, often remain unresponsive to sudden changes in traffic flow. To overcome this problem, this paper presents a real-time traffic signal control optimization system that leverages Internet of Things (IoT) sensors and quantum- inspired optimization algorithms. The system uses IoT- enabled cameras and sensors to continuously monitor real-time traffic information such as the number of vehicles, queue length, and traffic flow rate. This information is processed using Quantum Annealing and quantum- inspired algorithms that solve Quadratic Unconstrained Binary Optimization (QUBO) problems associated with traffic signal control. Based on the optimized output, the system dynamically controls the green light time to minimize waiting time and optimize traffic flow at intersections. A simulation environment was created using PyGame to analyze the system's performance under various conditions. The results reveal significant improvements in terms of average waiting time and traffic flow rate compared to conventional traffic signal control methods. This solution highlights the potential of quantum- driven optimization techniques to develop efficient and adaptive traffic management systems for future smart cities.

Keywords - Quantum Computing, IoT, Traffic Optimization, QUBO, Quantum Annealing, PyGame Simulation, Smart Cities, Intelligent Transportation Systems.

An Automated Web Security Configuration Assessment Framework for Proactive Vulnerability Detection and Remediation

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Abstract - Instead of sophisticated exploits, avoidable deployment errors often reveal critical security flaws in modern web applications. Production environments are susceptible to well-known attack vectors because security hardening is frequently delayed during time-constrained development cycles. This paper presents AWSVAT (Automated Web Security Vulnerability Assessment Tool), a novel unified assessment framework that systematically evaluates four orthogonal security dimensions: network service exposure, SSL/TLS configuration, HTTP response headers, and DNS infrastructure using entirely passive, ethically compliant analysis techniques. Unlike existing tools that manage individual protocol domains independently, AWSVAT integrates these assessment modules into a single developer-accessible platform with composite risk scoring and useful remediation advice. AWSVAT found critical configuration flaws in 82.3% of targets when validated against 127 production websites from the commercial, academic, and personal deployment categories. Important conclusions include insufficient TLS cipher suites (54.3%), missing Content Security Policy headers (77.7% of sites), and needlessly exposed administrative ports (35.4%). A significant negative correlation between TLS quality and header completeness scores ($\rho = -0.43$, $p < 0.01$) indicates common root causes in deployment automation gaps, and a chi-square test confirms that these flaws are not randomly distributed across deployment categories ($\chi^2 = 284.7$, $p < 0.001$). With a median assessment latency of 2.8 seconds and a peak memory footprint of less than 128 MB, AWSVAT achieves 92.3%–98.7% detection accuracy across all modules. By offering structured remediation, AWSVAT bridges the crucial gap between enterprise-grade security tooling and the requirements of academic and small-scale deployment environments with roadmaps that are understandable to nonexpert developers.

Keywords - Automated Web Security Assessment, Configuration Drift, SSL/TLS Analysis, HTTP Security Headers, Passive Vulnerability Detection, Web Application Security, Ethical Scanning, Risk Scoring.

Deepfake Detection Using Deep Learning

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Abstract - Artificial intelligences is the quick development has led to deepfakes or incredibly lifelike synthetic media. Even though this technology will be helpful in industries of entertainment and digital content creation There are significant risks associated with its misuse, including identity fraud, inaccurate information and privacy breaches It's getting very harder to make a spot such altered content now because of the subtlety of visual artifacts and advancements in generation techniques. To make address this challenge our work will provides a deep learning-based framework works effective deepfake detection it integrates temporal and spatial analysis. The way they recommend to process video inputs is through the steps of frame extraction, face localization normalization, and feature learning. A ResNeXt-based Convolutional Neural Network finds spatial inconsistencies while a Long Short-Term Memory network models temporal dependencies between frames [3] [10]. Systems are evaluated and trained using benchmark datasets such as Celeb-DF and FaceForensics++. Combining temporal and spatial features improves robustness and detection performance in a variety of deepfake scenarios based on experiment results.

Keywords - Convolutional neural networks deep learning deepfake detection and image forensics.

Deep Learning Based Violence Detection in Surveillance Images and Videos

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Abstract - There is an enormous amount of visual data that needs to be continuously monitored due to the widespread use of surveillance cameras in public transportation hospitals shopping centers and educational campuses. Conventional CCTV systems mainly rely on human operators to monitor several screens which is frequently ineffective and unreliable because of weariness distraction and short attention spans. Critical events like physical altercations assaults or aggressive conduct may therefore go unreported or be discovered too late. The Deep Learning-Based Violence Detection System presented in this paper analyzes uploaded images and live video streams automatically.

In order to accurately identify violent activities, the system uses a CNN-LSTM architecture to capture both temporal patterns (motion across frames) and spatial features (such as posture and human interactions). While users can upload a single image and get immediate results in image mode live mode processes video frames continuously in real time. When violence is detected, the system creates alerts with a timestamp and confidence score and records the incident in a history database.

The suggested system achieves high detection accuracy (up to 92 percent) with fewer false alarms and quick response times according to experimental results. The systems straightforward effective and practical design minimizes the need for ongoing human oversight while enhancing safety dependability and response efficiency in surveillance settings.

Keywords - Violence Detection, Deep Learning, CNN- LSTM, Surveillance System, Computer Vision, Real-Time Monitoring.

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Hallucination Detection and Reduction in Large Language Models: A Practical Study

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Abstract - Large Language Models (LLMs) have become pivotal in Generative AI, yet they frequently suffer from hallucinations producing confident but factually incorrect information. This paper introduces the Tri-Layered Hallucination Mitigation Framework (THMF), a multi-stage system designed to identify and reduce fabricated outputs by integrating self-consistency checking, Retrieval-Augmented Generation (RAG), and external knowledge verification. The primary objective of this research is to enhance AI trustworthiness in accuracy-critical domains like healthcare and academic research. Experimental results demonstrate that while a standalone LLM operates at a 68% accuracy rate, the proposed THMF significantly improves performance, achieving a 90% accuracy rate and a low hallucination frequency. These findings suggest that system-level grounding and verification are essential for deploying reliable generative AI without the need for intensive model retraining.

Keywords - Generative AI, Large Language Models, Hallucination, Retrieval-Augmented Generation, AI Trustworthiness.

A hybrid ensemble learning based AI powered agricultural decision support system for crop recommendation and yield prediction

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Abstract - Agriculture remains an essential sector in the global economic development process and food security; however, the agricultural sector faces growing difficulties due to climate variability, soil degradation, and poor resource management. Conventional experience-driven farming practices have not been able to offer adequate guidance for crop recommendation and yield prediction under changing environmental conditions. AI- though machine learning algorithms have shown encouraging results in agricultural analytics, most existing solutions have been based on individual machine learning models and lack integrated decision support systems. This paper presents an AI- driven Agricultural Decision Support System (APA-DSS) using a hybrid ensemble learning approach that combines machine learning and deep learning models. The proposed solution uses Random Forest and XGBoost as base models, and a Multi-Layer Perceptron (MLP) as a meta-model using a stacking ensemble learning strategy. The proposed system supports crop recommendation (classification) and crop yield prediction (regression) tasks using soil nutrient property values, climatic factors, and seasonal data. To improve transparency and user confidence, explainable artificial intelligence techniques are used for feature importance analysis and interpretation. The hybrid approach is tested using common performance evaluation metrics such as accuracy, precision, recall, F1-score, R2, RMSE, and MAE, and confusion matrix analysis for classification problems. The experimental outcome shows that the hybrid model based on stacking outperforms the machine learning and deep learning models. Moreover, the APA-DSS system is implemented as a web-based platform using a PHP-based frontend and a Python- based machine learning backend, which allows for real-time and user-friendly agricultural decision-making. The proposed method is a scalable, interpretable, and high-performance solution for precision agriculture.

Keywords - *Agricultural Decision Support System, Hybrid Ensemble Learning, Random Forest, XGBoost, Multi-Layer Perceptron, Stacking, Crop Recommendation, Yield Prediction.*

Gamified AI Driven Environmental Education for Primary Schools

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Abstract - GamifyEnvEd (Gamified Environmental Education Platform) is an interactive platform designed for primary school students by integrating level-based learning through interactive game-based learning using an online tool created using React.js and Next.js for the front-end, Node.js and Express.js for the back-end, MongoDB to manage data, and OpenAI to generate intelligent questions. The traditional methods used for teaching children about the environment have typically involved mostly boring, traditional forms of teaching such as using textbooks and static quizzes which do not motivate students to participate in continued learning about the environment, nor do they generate environmentally sustainable behavior after the learning event. The GamifyEnvEd was developed in order to create a comparative study of using traditional versus gamified learning methods in order to motivate students to actively participate and engage in environmentally sustainable behavior and create a comparative analysis of gamified versus non-gamified learning experiences with a focus on gamified learning and adaptive learning based on established research methods. Overall, the findings from this study will indicate whether or not a combination of gamification and artificial intelligence will provide an effective means of increasing the number of primary school aged children involved in environmental education.

Keywords - Gamification, Environmental Education, Artificial Intelligence, Primary Schools, Interactive Learning, Adaptive Learning.

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Efficient Net-B0 Model for Automated Oral Lesion Classification and Early Oral Cancer Detection

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Abstract - In this study, an automated deep learning technique for the early detection of oral cancer is introduced. The system categories the oral cavity images into three groups: normal, precancerous, and cancerous using the EfficientNet-B0 model. The existing system applied ResNet-101 and Faster R-CNN on 2155 oral images. The proposed system uses an EfficientNet-B0 to classify oral lesions on kaggle 1312 oral images which results in approximately 95% accurate performance and requires low computational resources. The result confirm that EfficientNet-B0 achieved through 94.0% to 95.8% inference time of 114.60 milliseconds, whereas ResNet-101 operators with an accuracy range of 87.9% to 90.0% process data at 148.60 milliseconds and this improvement is statistically significant ($p < 0.001$), demonstrating its effectiveness for oral cancer detection. These results show that the EfficientNet -B0 model which we developed achieves better accuracy in oral cancer classification. The system requires less time to process and has simplified design elements which make it appropriate for use in actual clinical screening that requires fast and efficient resource usage.

Keywords - Oral Cancer Detection, ResNet-101, Deep Learning, EfficientNet-B0, R-CNN, Oral Images, CNN, Classification.

Feature importance analysis for solar forecasting using explainable AI

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Abstract - Proper solar photovoltaic (PV) power forecasting is important in ensuring grid stability in renewable-dominated energy systems. Despite recent high prophetic accuracy, deep literacy and ensemble models are black boxes and, thus, cannot be trusted by drivers or implemented on a large scale in power networks that have safety-critical loops. This paper suggests an interpretable and multimodal forecasting frame, which combines temporal deep-literacy networks, tree-grounded ensembles, and voluntary sky-image encoders with resolvable artificial intelligence (XAI) to conduct systematic point-significance analysis. Experiments on multi-season data of mileage-level PV shops utilize SHAP-grounded criterion, permutation significance, and partial-dependence analysis to provide both global and original explanations without immolating forecasting performance. Experiments on multi-season datasets show that the proposed piled ensemble continuously outperforms standalone LSTM, grade-boosting, and motornascences to prognosticate day-ahead and intrahourmidairs. Point-significance outcomes demonstrate that variables related to irradiance and pall. Adaptive retraining across changing rainfall regimes based on drift monitoring on the basis of temporal variabilities in criterion distributions further underpins practicable functional sapience with conservation of high accuracy under conditions of safe deployment in smart-grid environments. The results substantiate that bedding explainability into hybrid solar-forecasting systems will provide practicable functional sapience whilst safeguarding high accuracy.

Keywords - Self-supervised learning, electronic health records, tabular data, early disease detection, clinical prediction, sparse data, representation learning, healthcare AI.

State of charge estimation in Li-ion batteries using data-driven techniques for EVs

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Abstract - The battery management systems (BMS) of electric vehicles (EVs) rely on accurate estimation of state of charge (SOC) that directly influence the longevity, performance and safety. Traditional methods have limitations in dealing with nonlinearity, ageing and different operating condition. With the help of machine learning (ML) and deep learning (DL), data-driven approaches have emerged as feasible alternatives in recent years. This survey presents a detailed overview of the estimation methods of SOC which include DL algorithms such as deep neural network, (DNN), recurrent neural network (RNN), long-short-term memory (LSTM), gated recurrent units (GRU), convolutional neural network (CNN), hybrid architectures and ML algorithms such as artificial neural network (ANN), support vector regression (SVR), k-nearest neighbors (kNN) and ensemble learning. Comparative analysis of existing studies shows that DL-based models, particularly LSTM and GRU, achieve higher estimation accuracy with error rates typically below 1-2% under dynamic conditions, outperforming traditional methods. It also focuses on lightweight DL architectures for real-time applications, hybrid models, transfer learning and federated learning.

Keywords - li-ion battery, electric vehicles, State of charge, battery management system, deep learning, long short-term memory.

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SARAL YATRA - A Smart Public Transport Monitoring System

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Abstract - In contemporary public transportation systems, congestion, unpredictable bus schedules, and limited visibility of the real-time status of buses are common issues. These factors contribute to making public transport uncomfortable for commuters. This research paper presents SARAL YATRA, which integrates three essential features, namely passenger estimation, GPS localization, and digital ticketing, in one application suite. A compact version of the YOLOv8 algorithm is used to estimate the number of passengers on the bus from camera footage captured on the bus. This method has achieved 87% accuracy in estimating the occupancy of the buses under typical indoor conditions with varying bus lighting and movement. The GPS localization, ticket validation, and role-based access control operations are performed using a Flask-MongoDB framework, while the React-based front end allows the user to visualize the bus location and occupancy as well as purchase tickets. Drivers operate a separate interface that switches on the bus camera and location services, maintaining a constant update to the system. Bench tests conducted on real bus routes show that SARAL YATRA achieves reliable updates of occupancy at short intervals with a low computational cost, hence proving to be a feasible and scalable solution toward better transparency and commuter decision-making across public transport networks in the urban landscape.

Keywords - Smart transportation, SARAL YATRA, IoT, machine learning, computer vision, public transit, real-time monitoring, GPS tracking, fleet management, cloud computing, urban mobility.

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A Hybrid Multi-Source Retrieval Framework for Code Similarity Analysis Using Transformer Embeddings and Pedagogical Quality Assessment

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Abstract - In the contemporary landscape of software engineering education, the exponential growth of open-source repositories and the ubiquitous presence of AI-assisted programming tools have precipitated a critical challenge: the erosion of academic integrity through sophisticated code cloning. Traditional token-based detectors often fail to identify semantic clones, where functional intent is preserved despite radical syntactic variance. This paper presents the implementation of a hybrid framework that synthesizes Transformer-based semantic embeddings, Abstract Syntax Tree (AST) structural comparison, and lexical analysis into a unified re-ranking pipeline. It further incorporates an automated quality assessment engine using standard software metrics to provide pedagogical feedback. We detail the system's architecture, which leverages FAISS for scalable retrieval and the Zhang-Shasha algorithm for precise structural verification.

Keywords - Code Similarity Detection, Abstract Syntax Tree, Semantic Similarity, Lexical Similarity, CodeBERT, FAISS, Static Analysis, Software Engineering Education.

Dual-Space Binary Hyperdimensional Computing for Resource-Constrained Image Classification

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Abstract - The escalating prevalence of IoT and wearable technologies necessitates the development of sophisticated artificial intelligence systems capable of direct operation on resource- constrained devices. Traditional machine learning models typically require substantial computational resources and memory, which constrains their utility in edge environments. While Hyperdimensional Computing (HDC) offers a compelling alternative through its capacity for parallel processing with reduced power consumption, existing HDC methods frequently encounter difficulties with intricate image data, often requiring computationally intensive representations. To address these limitations, we introduce a Dual Space Binary HDC classifier, which operates exclusively with a binary (0 and 1) representation. This design choice obviates the need for floating point computations, instead leveraging efficient bitwise operations based on Hamming distance. Consequently, this leads to a reduction in memory footprint and an acceleration of processing speed. To maintain critical local feature information, a novel Pair Representation method is incorporated; in this scheme, each input is encoded into both a low-dimensional binary vector and a high-dimensional hypervector. Classification is then determined by a weighted fusion of similarity scores derived from both these representations. Empirical evaluation, conducted using a subset of the CIFAR-10 dataset, indicates that the proposed methodology achieves a favorable trade-off among accuracy, computational efficiency, and memory consumption. These characteristics suggest its suitability for various Edge AI applications.

Keywords - Hyperdimensional Computing, Image Classification, Machine Learning, Edge AI, Binary Encoding, Hardware- Efficient Computing.

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Real time plant disease detection and prevention using AI and IoT in smart agriculture

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Abstract - The growing world demand for food security requires sophisticated agricultural monitoring systems to prevent crop loss due to plant diseases. This paper introduces an AI-based precision agriculture system with IoT sensors, deep learning, and predictive analysis for real-time detection and prevention of plant diseases. Our system uses a ResNet-18 model for image-based disease classification with 98.70% validation accuracy on 38 plant disease classes and an LSTM-based predictive model for environmental risk assessment with 98.02% test accuracy. IoT sensors such as DHT11 (temperature and humidity), YL-69 (soil moisture), and MQ-135 (gas levels) measure real-time environmental conditions sent through ESP32 to the cloud. The system sends real-time alerts and actionable recommendations to farmers through a mobile app, outperforming with a 99% weighted F1-score and <2.5s inference latency. This novel approach improves crop yield, decreases pesticide use, and empowers farmers with data-driven decision-making.

Keywords - Precision Agriculture, Deep Learning, IoT, Plant Disease Detection, ResNet-18, LSTM, Predictive Analytics, ESP32, Real-Time Monitoring insert.

Graph Neural Network Approaches for Fault Prediction in Solar Bi-Hybrid Electric Vehicles: A Systematic Review

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Abstract - Solar bi-hybrid electric vehicles (SBHEV)-integrating solar photovoltaic energy with battery operated motor systems, are emerging as a sustainable alternative to conventional internal combustion engine vehicles. Diverse architecture of SBEVHs with MPPT units, batteries, inverters, and traction motors introduces complex failure modes across solar panels. Traditional fault detection techniques based on thresholding, machine learning, or classical deep learning struggle to capture inter-component dependencies and fault propagation patterns. Graph Neural Networks (GNNs), which model systems as an interconnected graph of components, offer a powerful new approach for predictive maintenance in electric and renewable-energy-integrated vehicles. This article presents a systematic review of GNN-based fault prediction techniques with a special focus on their applicability to Solar Bi-hybrid Electric Vehicles (SBHEVs). The review covers graph construction methodologies, spatio-temporal GNN architectures, training strategies, benchmark datasets, and evaluation metrics used in existing literature. A comparative analysis of conventional AI, graph analytics, and GNN models is presented. The paper further pinpoints challenges—data scarcity, real-time inference constraints, multi-modal sensor fusion, and lack of standardized graph-based datasets, and outlines key research opportunities for applying GNNs to solar-integrated hybrid vehicles. This review highlights GNNs significant potential for early fault diagnosis, component-level anomaly detection, and reliability enhancement in next-generation solar-powered electric mobility systems.

Keywords - Graph Neural Networks, Solar Bi-Hybrid Electric Vehicles, Fault Prediction, Predictive Maintenance, Graph Analytics, Spatio-Temporal Deep Learning, AI for Electric Vehicles, Solar PV Vehicles.

A Hybrid QWOA Optimized PAFPN-SE Framework for Multiclass Structural Defect Segmentation

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Abstract - Defects such as cracks, spalling, corrosion, efflorescence and vegetation growth can highly affect the integrity of concrete structures over time. However, most of the traditional methods of inspection are manual, time-consuming, and error-prone, and thus not effective enough in large-scale infrastructure monitoring. In order to overcome these difficulties, this work aims to create an automated framework based on deep learning (DL) models that uses the S2DS dataset to identify and segment various kinds of structural defects at the pixel level. First, the images are pre-processed through procedures such as resizing, contrast enhancement, and normalization. Also, the data augmentation technique is used to increase the diversity and robustness of the models. For feature extraction, Atrous Spatial Pyramid Pooling (ASPP) combined with the Data-efficient Image Transformer (DeiT) architecture is used. Then, the segmentation model, Path Aggregation Feature Pyramid Network (PAFPN), enhanced with Squeeze and Excitation (SE) blocks, is applied. To accurately distinguish various defects from the background, this helps in learning the unique features of each defect type from the extracted images. Finally, Quantum Encoding Whale Optimization Algorithm (QWOA) is employed to optimize critical deep learning hyperparameters, which increases the performance of defect segmentation. The results showed that the proposed approach achieves high segmentation performance for thin and small defects, with F1-scores of 98.9% for cracks and 98.4% for corrosion, demonstrating its effectiveness in accurately detecting fine-grained structural defects. The proposed method provides reliable segmentation results which can be used for monitoring structural defects that occur in real world applications. Overall, the framework proved to be a useful and comprehensible approach for accurate structural defect segmentation. The proposed framework shows accurate segmentation results, but its performance depends on the number of samples and testing setup. The research will use more substantial and different types of real-world data to develop better models which can operate in multiple situations.

Keywords - Deep Learning, Normalization, Path Aggregation Feature Pyramid Network, Structural Defects and Structural Health Monitoring.

A survey of deep learning methods for leukemia detection and classification

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Abstract - Leukemia is a hematologic malignancy, which is life-threatening and affects a significant percentage of the population, hence the urgency of accurate, timely, and effective diagnostic procedures are required. Traditional methods are lengthy, prone to human bias, and often do not have the ability to discern morphological differences that are subtle and form the major discriminating factors that exist between different subtypes of leukemia. The detection and classification of leukemia in microscopic blood images has been widely changed by modern approaches such as deep learning, especially convolutional neural networks (CNNs) often achieving very high accuracy in differentiating malignant cells (leukemic blasts) from healthy blood cells. This survey explores the latest methods and innovations in leukemia detection and provides an overview of deep learning techniques, compares state-of-the-art models such as Convolutional Neural Networks (CNNs), Vision Transformers (ViTs), ensemble methods, and hybrid approaches, and examines how they perform across different leukemia types. We present a structured comparison of models with tables summarizing architectures, data, and results, discuss the pros and cons of various approaches and identify research gaps and future directions such as the need for more diverse datasets, better generalization, interpretability, and integration into clinical workflows. The articles that were published in 2015-2025 were reviewed to explore the developments in deep-learning approaches for leukemia diagnosis based on the analysis of peripheral blood smear images. The articles were selected from reputed publishers such as Elsevier, Springer, Wiley, IEEE, MDPI, ACM, and others.

Keywords - Leukemia, Blood smear images, White blood cells, Convolutional Neural Network, Vision Transformers.

A Multi-Modal Approach for Prediction of Lung Diseases using Xception Model

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Abstract - This research work follows a sustainable multi-modal approach to predict lung cancer, COVID, Tuberculosis (TB), and pneumonia in the early stage to save the life span of the human being. It aims to offer the Sustainable Healthcare System for the wellbeing of the human. A prime focus is to investigate about classification Lung diseases and prediction of the same using deep learning models, focusing on ResNet50, VGG16, and Xception. The proposed method is also integrated with the prediction of COVID, Tuberculosis and Pneumonia. It highlights the efficiency of the Xception model which integrates separable convolutions in depth-wise to attain superior feature extraction and classification accuracy. Experimental results are recorded and highlights that Xception outperforms other models by achieving 94.97% accuracy, 93.6% sensitivity, 92% specificity. These findings set up the effectiveness of advanced CNN architectures in medical-image analysis and their efficiency to improve early detection of lung cancer and also the other lung diseases.

Keywords - Lung Cancer, Deep learning, CNN, ResNet50, VGG16, Sustainable Healthcare, Xception CNN, Medical image, CT image.

Identification of AI generated Text using Perplexity and Burstiness

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Abstract - Real-time object detection is a significant problem domain in computer vision with many applications, ranging from surveillance to autonomous driving and image enhancement. We present an assessment of two new state-of-the-art object detection models—Fast R-CNN and Faster R-CNN—as a tool for mapping water features in real-time applications by quantifying the speed and accuracy with which both algorithms can detect objects. Fast R-CNN improves speed and accuracy by combining a region proposal network with a convolutional neural network (CNN) and introduces an RoI (Region of Interest) pooling layer which takes every proposed region from the previous stage, extracts CNN features for it. These features are then subjected to classification and bounding box regression. On the other hand, Faster R-CNN speeds up detection with its Region Proposal Network (RPN) that generates Region proposals from feature maps and eliminates the need of separating region proposal mechanisms. Results revealed Faster R-CNN outperforms Fast R-CNN with regard, both to accuracy and speed—excellent in real-time detection. In this paper, we train R-CNN and fast R-CNN, comparing their accuracy, speed and memory efficiency against one another as well as against other state-of-the-art methods of object detection. In addition, it investigates the influence of hyperparameter modifications and contrast between architecture modulators on their performance, providing a comprehensive review of its advantages and disadvantages.

Keywords - Deep Learning, Neural Network, Fast R-CNN, Faster R-CNN, Performance Accuracy.

Real Time Object Detection using R-CNN and Faster R-CNN

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Abstract - The advanced Artificial Intelligence language models, such as ChatGPT, have raised significant apprehensions about the discernment between human-authored and artificial intelligence-generated text in scholastic and academic settings. Identifying AI-generated writing is difficult since powerful language models such as GPT-3 may produce text that looks quite similar to human-generated information. Perplexity is a metric for how well a probability distribution or model predicts a sample. Perplexity measures how effectively a language model predicts a succession of words. AI-generated text frequently exhibits lower confusion than human-generated material. This is because language models, such as GPT-3, are trained on large datasets and may produce coherent and contextually suitable text. Lower perplexity suggests that the resulting text is more predictable based on the language model. AI-generated text frequently exhibits lower confusion than human-generated material. This is because language models, such as GPT-3, are trained on large datasets and may produce coherent and contextually suitable text. Lower perplexity suggests that the resulting text is more predictable based on the language model. This study describes how to detect AI-generated text using perplexity and burstiness.

Keywords - AI generated text, Burstiness, GPT-3 & 4, Human generated text, Perplexity.

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Sentiment ranking for unicode emojis using Emosent-py

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Abstract - A natural language processing (NLP) method called sentiment analysis, also known as opinion mining, is used to identify whether data is positive, negative, or neutral. Sentiment analysis is frequently used on textual data to assist businesses in understanding customer needs and tracking sentiment towards their brands and products in customer feedback. Emojis, a new breed of emoticons, are becoming more and more common in social media and mobile communications. Sentiment ranking for emojis refers to assigning a sentiment or emotional value to emojis based on their common usage and interpretation. This ranking can vary depending on cultural context and individual interpretation, but generally, some emojis are associated with positive sentiments while others may convey negative emotions. The ranking can be based on how people typically use emojis in various contexts, including social media, messaging apps, and online communications. Emosent-py provides a framework for analyzing text sentiment based on a pre-trained model. In this study, we apply Emosent-py to a dataset of Unicode emojis and evaluate their sentiment ranking for European language across different cultural and linguistic contexts.

Keywords - Flair, Sentiment Analysis, Textblob, Transfer Learning, Vader.

Hybrid XGBoost-LSTM Ensemble with Attention Mechanism for Remaining Useful Life Prediction of Turbofan Engines

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Abstract - Predictive maintenance of aircraft turbofan engines is a major issue in aerospace engineering whereby effective predictive maintenance of Remaining Useful Life (RUL) may be used to avoid disastrous failure and also to save on operational expenses. In other words, schemes presently exist largely on single-model deep learning frameworks that learn temporal relations or classical machine learning frameworks that utilize statistical characteristics and fail to leverage the synergistic advantages of the two paradigms combined. This paper suggests a hybrid ensemble model in the form of an attention-based Long Short-Term Memory (LSTM) network and an Extreme Gradient Boosting (XGBoost) regressor that is used to predict RUL of the turbofan engines. The LSTM attention mechanism takes sensor sequences of 73-dimensional feature vectors comprising 3 operating condition settings, 14 raw sensor readings, and 56 engineered features derived from 4 statistical features computed across 14 sensors, through 50 cycles to learn how to degrade over time, whereas XGBoost predicts using the same engineered feature space as viewed statistically. A grid search is used to optimize a dataset-specific blending weight on a separate validation partition to produce a weighted ensemble prediction. To address the problem of multi-condition engine operation in FD002 and FD004, KMeans clustering is used to determine six operating regimes and per-cluster z-score normalization to decouple sensor baseline shifts and actual degradation signals. LSTM training uses Huber Loss with a delta value of 10 so that it is robust to outlier engines. The Proposed system is tested on the four sub-datasets of NASA C-MAPSS benchmark. Findings have shown that the most successful model depends on the complexity of the sub-datasets: standalone LSTM performs best on FD001 and FD003 with root mean square error values of 15.58 and 13.54 respectively, whereas the hybrid ensemble performs better on the multi-condition sub-datasets FD002 and FD004 with root mean square error values of 17.47 and 23.56 and R-squared values of 0.83 and 0.70 respectively.

Keywords - Remaining Useful Life, Predictive Maintenance, LSTM, XGBoost, Hybrid Ensemble, Attention Mechanism, NASA C-MAPSS, Turbofan Engine Degradation, Huber Loss.

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CuraCore an agentic AI driven student centric mental health support platform

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Abstract - Students of universities are under increased pressure of psychological strain because of the academic pressure, career uncertainty, and societal expectations. Despite the increased awareness on mental health, help seeking behaviour is low due to stigmatization, barriers to access and privacy costs. Many existing digital mental health platforms are fragmented and reactive in nature and do not have much knowledge about emotional context or have adaptive assessment features. In this paper, CuraCore is presented as a student-oriented mental-health support platform being designed based on the principles of agentic artificial intelligence. The system combines conversational AI, emotion detection based on transformer, identification of the crisis severity, adaptive multilevel assessment, tracking of the contextual memory, intelligent routing of recommendations, and is built into a single architecture. In contrast to conventional chatbot-based systems, CuraCore is capable of dynamically changing the level of interaction depth, preserving emotional context, and providing proactive interaction making use of coordinated decision logic. A student survey that was undertaken informed the system design with the focus being on personalization, confidentiality, and constant monitoring. Experimental testing proves that it is stable in real time responsiveness and cross module integration. The suggested framework depicts the applied use of agentic AI coordination to develop scalable and student centred model digital mental health support systems.

Keywords - *Agentic AI, Digital Mental Health, Conversational AI, Emotion Detection, Adaptive Assessment, Crisis Detection*

Deep Learning Based Hybrid MobileNetV2–SVM Architecture for Pomegranate Disease Detection

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Abstract - Growing pomegranates is a big part of horticultural farming, especially in places with a steppe climate like India. But fungal and bacterial diseases like Alternaria, Anthracnose, Bacterial Blight, and Cercospora have a big impact on pomegranate production. These diseases make the fruit less healthy and less plentiful. Traditional disease diagnosis depends on manual inspection, which takes a long time and could lead to mistakes by people. To address this challenge, our paper presents a lightweight hybrid framework for the automated detection of pomegranate fruit diseases utilizing deep learning and machine learning methodologies. The suggested system uses MobileNetV2 to get features and Support Vector Machine (SVM) to sort them. Training and testing were done on a dataset with almost 5,099 labelled fruit images from five different disease classes. The proposed MobileNetV2–SVM model has an accuracy of 98.92% in experiments, and it doesn't require a lot of computing power. The lightweight design makes it possible to use on-edge devices like smartphones and drones. Which gives an effective way to keep an eye on agricultural diseases in real time.

Keywords - Pomegranate Disease Detection, Deep Learning, MobileNetV2, Support Vector Machine, Image Classification, Precision Agriculture.

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Smart Banking Kiosk for Automated Cash Transactions and E-Challan Processing

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Abstract - The suggested assignment, "Automated E-Challan Generation for Bank Transactions" brings forward the progressive solution of automating the methods of deposits and withdrawals and increases the efficiency of operations and the facilities to the consumer. This system uses an Arduino UNO microcontroller to manipulate and coordinate the interaction between different hardware additives, as well as an IR sensor to detect the appearance of a person, a keyboard, an LCD screen for real-time fame, a LCD screen for real Focus. To generate a voting sensor, and a thermal printer to generate an e-thinking (a thermal printer). When you discover the presence of a person through the IR sensor, the Gadget activates the consumer through a voting-assisted menu and performs the course, which provides the opportunity to draw the budget deposit or budget. User enters the transaction information through the keyboard, and this information is processed to ensure accuracy and security. When the transaction is complete, the system produces and prints a receipt, and removes the desire for traditional manual form filling. This method no longer reduces errors and operating costs, even though the bank reduces queues and crowds in the environment. Voting -assisted interfaces improve access to technology -hiked customers and people with disabilities. In addition, through automatic repetitive transactions, the gadget optimizes the use of assistance, complements preservative satisfaction and promotes a spontaneous banking. The proposed gadget stands as a practical and scalable response, which is capable of functioning due to traditional banking approaches and recalculating consumer operations.

Keywords - Automatic E-Challan, Arduino Uno, Deposit and Withdrawal Automation, Voice-Assisted Banking, IR Sensor, Keypad Interface, LCD Display, Thermal Printer.

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Energy Forecasting for IoT Smart Homes using Hybrid Feature Selection Methods and ElasticNet model

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Abstract - The problem of Internet of Things (IoT) smart home appliance energy forecasting is arising due to the growing need of reducing the household energy consumption. Machine Learning (ML) algorithms provide an efficient solution to address this problem by identifying the relevant features. The main objective of this work is to select the optimum features from the dataset and to accurately forecast the energy usage from home appliance data. In order to meet these objectives, we propose an energy forecasting for IoT smart homes using hybrid feature selection (HFS) methods and ElasticNet model. For feature selection, the hybrid Recursive Feature Elimination (RFE) method combined with Random Forest (RF) is proposed. It removes the unnecessary and redundant features and selects the optimum features required for prediction. Then, for dimensionality reduction, the Principal Component Analysis (PCA) technique is applied. Finally for energy forecasting from the selected features, the ElasticNet regression model is applied. Experimental results over the appliances energy prediction dataset show that the proposed HFS-ElasticNet model attains least error values and highest classification accuracy, when compared to the other simple regression models.

Keywords - Internet of Things, smart home appliances, Hybrid feature selection, ElasticNet, Recursive Feature Elimination, Random Forest.

An AI-Enabled Smart Traffic Management System Using Computer Vision for Urban Congestion Control

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Abstract - Urban traffic congestion has worsened because of the rising number of vehicles on the road and the 55 of fixed-time signal control systems. Traditional traffic management systems are not adaptable to real-time changes in traffic patterns and are not capable of dynamic responses to traffic variations. this paper describes an automated and interpretable smart traffic management system developed for centralized traffic control room settings. the system Employes Adaptive Background Subtraction (MOG2) for real-time vehicle detection and lane-based traffic density analysis from CCTV camera feeds without the need for any additional hardware or deep learning training datasets. a decision engine dynamically computes signal timings based on congestion levels, persistence modeling, and fairness-oriented scheduling algorithms. the system also enables emergency vehicle priority handling, multi-junction coordination, and traffic pattern analysis for peak hours. a web-based graphical user interface is used for real-time visualization of traffic patterns and signal control decisions. simulation results show better traffic flow efficiency than fixed-time signal control systems. the proposed system is computationally frugal and scalable for smart city applications with limited computational resources.

Keywords - Smart Traffic Management, Computer Vision, Vehicle Detection, Traffic Congestion, Adaptive Signal Control, Artificial Intelligence.

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Advancements in Infant Cry Recognition: A Deep Learning Approach for Improved Classification and Analysis

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Abstract - Infant cry analysis is a key factor in interpreting newborn requirements and identifying potential health problems. Recent developments in machine learning and deep learning have made it possible to improve automated cry recognition systems with high accuracy. This survey discusses different methodologies, such as feature extraction methods, supervised and self-supervised learning models, and deep learning architectures. Conventional approaches of prosodic and spectral feature extraction have seen their evolution with the incorporation of convolutional neural networks (CNNs), recurrent neural networks (RNNs), and transformer-based models. Self-supervised methods like vq-wav2vec have helped in cry recognition using small labeled datasets. Moreover, hybrid architectures that blend CNNs and RNNs have also produced optimistic results in cry category discrimination. The survey also investigates data augmentation methods, the effects of external sources like environmental noise, and real-world deployment issues. Despite all progress, data sparsity, heterogeneity of cry patterns, and computational efficiency are still major challenges. Future work should be directed towards creating scalable, robust models that can perform analysis in real-time while preserving interpretability and ethics in infant health monitoring. This research gives the state-of-the-art methods and suggests directions for enhancing infant cry recognition systems.

Keywords - Infant cry recognition, machine learning, deep learning, feature extraction, self-supervised learning, CNN, RNN, transformer models, data augmentation, acoustic analysis.

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AI-Based Energy Management System for Microgrids with Renewable Energy Integration

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Abstract - In Today's scenario usage of sustainable and reliable energy is more and there is a necessity of development of renewable energy sources like solar and wind power systems. To manage the energy generation, storage, and effective utilization is being managed by an AI based Energy Management System (EMS) framework for microgrids which performs a better control and decision-making operation. The Proposed system is implemented using ESP32 grounded bedded regulator connected with the energy management components. The system reduces reliance on traditional energy sources by roundly conforming weight precedence's rested on the battery's status and the vacuity of renewable energy. Artificial intelligence (AI) enhances the system's inflexibility by learning from formerly data and refining decision-making over time. Experimental studies indicate that this leads to farther effective energy use, dropped waste, and a more dependable power force. This exploration aids in developing intelligent microgrid systems by integrating AI, IoT, and bedded systems. The proposed approach can be applied in factories, smart demesne, and pastoral areas. It's also provident and scalable. New developments will include integration with smart grid architectures and advanced predictive analytics.

Keywords - Microgrid, Renewable Energy Integration, Energy Management System (EMS), Artificial Intelligence, IoT, ESP32, Smart Grid.

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Big data analytics for intelligent film marketing using social media trend prediction and sentiment based audience profiling

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Abstract - Big data analytics plays a vital role in modern film marketing by leveraging vast amounts of social media data to understand audience preferences and behaviors. This research focuses on using trend prediction and sentiment-based profiling to design intelligent marketing strategies for films. Existing methods often struggle with real-time processing, lack context-aware sentiment detection, and fail to capture evolving audience interests over time. These limitations hinder the accuracy and effectiveness of targeted film promotions. To address these challenges, we propose a novel framework called Hybrid Deep Learning Model for Trend Prediction and Sentiment Analysis (HDLM-TP-SA). This framework integrates temporal trend forecasting with semantic sentiment extraction, enabling dynamic and precise audience profiling. The proposed method combines Long Short-Term Memory (LSTM) networks for predicting trending topics and Bidirectional Encoder Representations from Transformers (BERT) for in-depth sentiment analysis. This hybrid approach allows marketers to identify popular film-related themes and emotional responses in real-time. Findings demonstrate that the HDLM-TP-SA framework significantly improves the accuracy of audience segmentation and enhances the effectiveness of personalized film marketing strategies. It enables timely and emotionally resonant promotional content delivery, leading to higher audience engagement and campaign success.

Keywords - Big Data Analytics, Film Marketing, LSTM, BERT, Sentiment Analysis, Trend Prediction.

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Machine Learning Approaches for Residential Electricity Prediction: A Multimetric Comparative Study

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Abstract - Residential electricity consumption has been a tremendous increase in the last few decades. According to recent trends, the consumption of power in residential premises has been increasing dramatically because of the adoption of modern appliances and an increase in population. The demand of electricity is the real power consumption requirement in residential environments. Making a forecast on the consumer electricity use is the important aspect in the reliability of the overall smart grid system. Precise forecasting activities are important in planning electrical resources and maintaining a balance between demand and supply in the system. The paper uses a complete list of machines learning predictive models used to predict residential electricity consumption, including regression-based models including Linear Regression, Lasso Regression, Ridge Regression, Elastic Net Regression, Polynomial Regression; tree-based models including Decision Tree Regressor, Random Forest Regressor, and Extra Trees Regressor. The analysis is based on a carefully gathered data on electricity consumption in the four years 2016-2020. The comparative analysis is done using the above models and LightGBM Regressor provides better accuracy. The standard error measures such as Root Mean Square Error (RMSE), Mean Absolute Error (MAE), Mean Squared Error (MSE), and the coefficient of determination (R^2) are used to assess model performance, and the cross-validation score.

Keywords - Forecasting, Machine Learning Models, Residential Area, Time Series Analysis, Electricity Consumption.

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Design and Implementation of a Self Triggered IoT based Accident Alert System

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Abstract - The systematic system that involves modern IoT and embedded system techniques to provide real-time awareness of accidents and rescue signals to road users. The system relies on current modules of fall detection sensor, GPS- based landmarking and GSM communication technologies to facilitate convenient emergency call-in networks to the stranded victims in emergency cases. Fall recognition is more accurate and efficient, with the inclusion of accelerator and gyroscopes sensors, combined with the location detection systems based on GPS, especially in numerous implementation conditions. This study spearheads the safety technology development with its inexpensive portable tool filling the emergency communication gaps to follow the provision of safe chances of road safety and personal surveillance. Accelerator and gyroscope sensors, which include GPS modules, GSM modules, and assistive technology implementations have been integrated into the research as the fundamental components of the research.

Keywords - GPS System, GSM System, MPU6050, Arduino, Fault Detection, Emergency Rescue.

Paper ID: ICEMCSI2026-811

A novel topology conscious discrete particle swarm optimization method for multi objective routing

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Abstract - Routing is the important process to attain the best path in any type of network. The multiple contradictory objectives like minimize energy ingesting, congestion, delay and maximize path reliability. The operation should be focused to set a Pareto optimal solution. Traditional routing algorithms are facilitated with limited reliability and also focus on single objective in dynamic network topologies. This proposed methodology presents a novel topology – conscious Discrete Particle Swarm Optimization (DPSO) to perform well in multi-objective routing in graphical networks. In this method, network is considered as the discrete search space and routing paths are encoded as particles. In Addition, a topology awareness rule and fitness function is incorporated to identify the optimal path to extend the stability in routing criteria. This approach integrates Pareto optimality strategy to improve the convergence speed with the crowding distance. The results indicates that the proposed system performs well when tested for benchmark network topologies. Especially, end delay is decreased to 15 %, bandwidth utilization is improved to 15% with the existing utilization and 18% of path cost reduction. Thus, the novel framework stands with scalable and good solution in Mult objective routing. Also, this approach is found to more suitable for wireless Sensor Networks, IoT Systems, and communication Networks large-scale.

Keywords - Multi-objective Routing, Discrete Particle Swarm Optimization (DPSO), IoT Networks, Routing.

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Secure and Efficient Ration Management System Using VLSI Technology

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Abstract - The Public Distribution System plays a role in giving people the food they need at prices they can afford through ration shops. But the old ways of giving out ration have a lot of problems, like mistakes made by people getting ration who should not and not being able to keep track of things. A lot of the time people who get ration have to carry a card or use a system that checks their fingerprints, which can be annoying when it does not work because the sensor is bad or it is hard to verify. Because of all these problems we need a way to give out ration that's simple and works well. This paper is about a way to give out ration using a smart system that uses a special number to check who people are instead of checking their fingerprints. The system is made using hardware. People enter their special number on a keypad. The system checks the number with the information it has and only people who are allowed can get ration. The system uses computer chips and is made using a language that tells the computer what to do. When people enter their number correctly the system starts the ration process. Shows them what they need to know on a screen. Using a number to check who people are makes the process easier. We do not have to use fingerprint checks as much. The system is also more secure. There is less chance of people making mistakes so the right people get the ration they need. The new ration system is meant to be cheap and work well. It helps make the Public Distribution System more transparent and makes sure ration is given out in a way.

Keywords - Public Distribution System, VLSI, ration authorization system, identification number authentication, FPGA, hardware description language, secure ration distribution, digital system design.

A deployment oriented real time multimodal emotion recognition system using vision transformer and RoBERTa Based Models

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Abstract - Emotion recognition plays a vital role in affect-aware human-computer interaction systems. The multimodal emotion detection framework presented in this paper combines facial expression recognition and text-based emotion classification into a single web service. FastAPI is used in the system's implementation, and RESTful APIs enables real-time inference. Multi-label emotion prediction for textual analysis has been carried out by a transformer-based classifier which is based on RoBERTa and trained on the GoEmotions dataset. A Vision Transformer model that generates normalized emotion scores from input images is used to identify facial expressions. To guarantee stable and dependable deployment, the system includes secure authentication, input validation, and rate limiting.

Keywords - component, formatting, style, styling, Natural Language Processing (NLP), FastAPI, RoBERTa, GoEmotions.

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Comprehensive comparative study on sign language translation systems

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Abstract - Sign Language Recognition and translation system is a useful technology for society aims to reduce the communication gap between deaf or hard-of-hearing individuals and the hearing population. It is more helpful for the empowering of deaf community and also works together with common people. This paper focuses on comparative study of various recognition and translation techniques. The survey focused on Vision-based, Skeleton-based, Wearable sensor-based, and Hybrid Deep Learning model techniques currently suggested by most researchers. Each work is analysed in terms of algorithmic methodology, data requirements, computational complexity, accuracy, advantages, and limitations. Vision-based methods offer simplicity and cost-effectiveness but the accuracy depends on the quality of image or videos of the gestures. Skeleton-based method provides strong gesture representation and more accurate for dynamic movements; however, requires advanced tools or hardware. Wearable sensor-based methods helpful for accurate gesture recognition independent of environmental conditions; however, they also require advanced hardware and user dependency. This is not a budget friendly method. Hybrid Deep Learning architecture is an integration of vision, skeleton, and sensor-based technologies. It helps to translate both static and dynamic gestures. The review focused on comparing different SLR techniques, by considering each methods strength and weaknesses, and finally concludes Hybrid Deep Learning as the robust technique for sign language translation models. This comparative analysis helps researchers and application developers for selecting suitable technologies for practical applications and contributes the development of communication technologies.

Keywords - Sign Language Recognition (SLR), Sign Language Translation (SLT), Deep Learning, Computer Vision, Gesture Recognition, Human-Computer Interaction, Assistive Technology, Multimodal Learning.

Capturing Nonmanual Features of Indian Sign Language and Converting It into Text and Audio

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Abstract - One of the most enduring issues in inclusive human-computer interaction is effective communication between the deaf and the hearing communities. The paper will describe a real-time Indian Sign Language (ISL) recognition system that uses the latest single-stage object detection architecture called YOLOv8 to recognize hand gestures that represent the 26 alphabetical signs of ISL. The model was trained on 100 epochs with a custom-curated image dataset with all 26 classes (A through Z) and an F1-score of 0.93 at a confidence threshold of 0.611, with mAP at 50 of 0.989 and mAP at 50-95 of 0.902. The identified letter sequences are combined into words and sentences via an interactive real-time interface, and the text is translated into four languages: English, Telugu, Hindi, and Kannada with the help of neural machine translation. The output of the translation is also spoken out through the use of Google Text-to-Speech, which allows the audio accessibility of the translation to a wide range of users. It also has an AI chatbot which is powered by Google Gemini 2.0 Flash to provide contextual conversational assistance to the users of ISL. The system is implemented as a web application, based on Streamlit with WebRTC-based live webcam inference, which is hardware-agnostic and can be deployed widely. The soundness and scalability of the proposed framework as a possible assistive communication technology is confirmed by a detailed analysis using confusion matrices, training loss curves, precision-recall curves, and F1-confidence plots.

Keywords - Indian Sign Language, YOLOv8, gesture recognition, object detection, sign language translation, text-to-speech, multilingual translation, real-time inference, deep learning, assistive technology, Streamlit, WebRTC.

Neuro Scope: An AI Driven Framework for Early Stage Brain Tumor Detection and Staging Using Deep Learning

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Abstract - Early and rapid detection of brain tumors using magnetic resonance imaging (MRI) is one of the most urgent issues of clinical diagnostics because of the inconsistency of morphology and imaging conditions between tumors. This paper introduces Neuro-Scope, a smart and interpretable AI-based platform aimed at implementing automated brain tumor detection and staging. The proposed mechanism combines both a Convolutional Neural Net (CNN)-based classification module and a 3D U-Net-based segmentation network to classify and localize a tumor, respectively. The framework is tested and trained on the multimodal MRI dataset of BraTS 2020 and reports a 96.8% classification percentage on four cases: glioma, meningioma, pituitary tumor and no tumor. The segmentation module achieves a mean Dice Similarity Coefficient of 0.87 and Intersection over Union (IoU) of 0.81, which has accurate localization of the tumor boundary. Gradient-weighted Class Activation Mapping (Grad-CAM), also included to maximize clinical interpretability, gives visual insights into the model predictions. The system is implemented as a web-based platform with Flask, with secure data handling protocols. Combining classification, segmentation, and explainability proves to be efficient and experimental findings reveal Neuro-Scope as an effective clinical decision-support tool.

Keywords - Brain tumor detection; deep learning; convolutional neural network; 3D U-Net; MRI segmentation; Grad-CAM; BraTS 2020; clinical decision support.

Verification Framework for Posit Arithmetic in High-Accuracy Applications

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Abstract - The POSIT number system has emerged as a possible alternative to IEEE-754 floating point for precision-critical computer fields. However, the correctness and robustness of hardware POSIT units remain inadequately investigated, especially for edge-case behaviours such as regime transitions, rounding borders, fault tolerance, and pipeline interactions. Large sections of the input space remain unverifiable since existing works mostly rely on simulation-based techniques or sparse assertion checks. This study proposes a mathematically robust formal verification system for POSIT arithmetic blocks utilizing assertion-based verification with Cadence JasperGold. Unlike previous methods, the proposed approach introduces seven novel verification scenarios, including regime boundary validation, encode–decode symmetry, sticky-bit rounding correctness, fault-injection robustness, sequential pipeline consistency, timing-safety verification, and division-by-zero correctness. Comprehensive verification of P(16,3) arithmetic units (adder, subtractor, multiplier, and divider) exhibits much improved defect detection compared to simulation-only approaches. The results demonstrate that the suggested framework thoroughly demonstrates 100% accuracy for a number of crucial criteria and reveals minor design flaws in others. In order to enable reliable and reliable deployment of POSIT hardware in scientific, embedded, and machine learning accelerators, this study offers the first unified and extendable formal-verification suite for POSIT arithmetic.

Keywords - Assertion-Based Verification, Regime Transition, POSIT, Formal Verification, JasperGold, Rounding Correctness.

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Artificial Intelligence in Space Systems: A Critical Analysis of Architectures, Autonomy, Resilience, and Energy Aware Optimization

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Abstract - Artificial Intelligence is rapidly revolutionizing current space systems by providing autonomy, adaptability, and robustness in extreme environmental conditions. With the increasing number of satellite constellations and the need for less ground support in deep space missions, intelligent processing systems in space technology has become a crucial requirement. This paper provides a thorough review of 22 recent research studies on AI architectures and their implementation strategies in space technology. The research studies are systematically classified into perception-driven models, reinforcement learning based optimization, radiation-resilient strategies, and energy efficient hardware-software co-design strategies. Our review insights the important architectural aspects, such as the combination of convolutional and transformer models for perception, the increasing use of reinforcement learning for resource allocation and autonomous control, and the development of neuromorphic and accelerated computing architectures for energy-efficient results. In addition, the review discusses system level constraints specific to space environments, such as radiation faults, power constraints, communication latency, and scalability issues in satellite constellations. The review points out important research gaps in cross-layer integration, radiation benchmarking, onboard validation, and constraint-aware optimization. Based on the synthesis of the current literature, future research directions are discussed for developing fully integrated (Hybrid model), radiation-resilient, and energy-efficient AI-native space systems.

Keywords - Artificial Intelligence, Space Systems, Autonomous Satellites, Reinforcement Learning, Radiation Resilience, Energy Optimization.

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Data Driven Heart Disease Prediction using Machine Learning Models for Sustainable Health Care

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Abstract – The heart diseases are majorly affecting the human life irrespective of ages. It's a threat for the human life. There should be a strong computational tool for sustainable development of the human life with good health. To address these issues, parameterized data driven models have been framed and deployed to identify the heart disease in the early stage, so that, the survival rate can be sustained. This research work made an attempt to develop machine learning model with standard techniques like Logistic Regression, Decision Tree, Random Forest, and Support Vector Machine (SVM). The experimental results show performance of those techniques. The analysis highlights the best outcome of Random Forest method with highest accuracy (0.99), a precision (1.00), a recall (0.97), and an F1-score of 0.99. It outperforms the other methods.

Keywords - Machine Learning, Heart Disease Prediction, Support Vector Machine, Healthcare Analytics, Random Forest, Regression, Decision Tree, Sustainable development.

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A Predictive Framework for Android Device Failure using Real Time User Observations and ML Techniques

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Abstract – Android smart phones have problems with their performance Some of the problems are lag, getting too hot, and restarting when you don't want it to. These are the main reasons why data is lost and why the factory settings need to be reset. This research endeavor aimed to conduct a user-centric analysis of pre-failure indicators gathered from 110 Android users, alongside an examination of failure patterns by evaluating device specifications, usage, and observable symptoms. We have used machine learning methods to sort problems and guess when they will fail. The experimental results show that the Random Forest (86.4%) is the most accurate at making predictions, followed by the Decision Tree (81.8%) and the Logistic Regression (78.2%). It shows which features are most important and that hardware settings like RAM and storage don't have a big effect.

Keywords - Android, System Failure, Factory Reset, Smartphone Analysis, Random Forest, Machine Learning.

LLM based Cognitive AIOps Autonomous Cloud Incident Management

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Abstract – Modern cloud-native infrastructure demands continuous availability and rapid incident resolution, yet traditional on-call practices remain reactive, manually intensive, and psychologically burdensome for DevOps engineers. Mean time to resolution (MTTR) for production incidents typically ranges from 30 to 60 minutes, with engineers frequently interrupted during off-hours. This paper presents DreamOps, an autonomous AI-powered incident response and infrastructure management platform that leverages large language models (LLMs)—specifically Anthropic Claude—integrated via the Model Context Protocol (MCP) to automatically triage, diagnose, and remediate infrastructure incidents. DreamOps introduces a three-tier response architecture comprising autonomous resolution (YOLO Mode), human-supervised planning (Plan Mode), and human-approval execution (Approval Mode), governed by a probabilistic confidence scoring and risk classification framework. DreamOps leverages LLM-based reasoning combined with a structured execution framework to automate critical aspects of incident triage, diagnosis, and remediation. Unlike conventional automation scripts or rule-based systems, DreamOps dynamically adapts to novel scenarios by synthesizing contextual information across multiple data sources.

Keywords - Incident response automation, large language models, DevOps, Model Context Protocol, Kubernetes, AI agents, infrastructure management, on-call engineering, MTTR reduction, cloud-native systems.

Automated Student Attendance Monitoring and Analytics Systems

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Abstract – Attendance tracking is one of the most important activities in educational institutions for assessing student attendance and engagement in class. However, current attendance recording techniques depend mainly on manual approaches such as using manual attendance forms and spreadsheets. Such approaches are not efficient and accurate, particularly when dealing with larger classes and lectures. This research presents an Automated Student Attendance Monitoring and Analytics System based on QR code, face recognition and entering unique_id technique. Here, the lecturer will create QR codes for each class, which will be scanned by the students through their cellphones to keep the record of attendance. After this, students mark their attendance through face recognition and entering unique_id. When all the steps of marking attendance are done, overall present of the student will be marked, else it will be considered as absent if either of the steps are not done. Hence this ensures accuracy of attendance being marked and also eliminates proxy. In this way, the identity of the student who attended the class will be verified, and the attendance record will be kept in the database.

Keywords - Automated Attendance System, QR Code Technology, Attendance Analytics, Educational Technology, Student Monitoring System.

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Supply Chain and Retail Demand Optimization Using Gen AI

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Abstract – The retail industry is growing quickly these days. With market ups and downs, understanding demand is crucial for managing inventory and supply chains without excessive waste. Traditional forecasting methods usually rely on basic stats and guesswork based on past figures. They often overlook important factors, such as seasonal sales, price changes, and holidays that drive spikes in demand. That's why something more effective is needed. In this paper, we explore a framework that uses machine learning for demand forecasting and inventory optimization. It even incorporates some generative AI for improvement. The core component is an XG-Boost regression model that predicts monthly product demand. This model uses historical sales data along with information like product category, price, seasonal trends, and holiday frequency. By enriching the data this way, we can capture patterns that simpler methods miss. Once we obtain the forecasted numbers, the system dynamically calculates reorder levels. This ensures inventory is replenished just in time without overstocking. There's also a cloud-based setup that manages large data sets efficiently. Additionally, a module powered by generative AI translates predictions into explanations. It enhances visibility into inventory through an interactive dashboard that provides clear insights. Some may argue that traditional stats are sufficient, but the results here indicate otherwise. Overall, this framework creates a scalable platform for retail analytics in data-intensive supply chains.

Keywords – Supply Chain, XG-Boost regression model, Optimization.

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Analysis of Personalized Learning, Academic Navigation and Information Collector in PlanIC

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Abstract – PlanIC is an artificial intelligence-supported study aid tool developed with the vision to simplify and consolidate the key elements of the management of student learning. The system consolidates functionalities like a study planner with built-in reminders, a performance monitor for keeping academic records, and domain-specific tools like note summarization, question generation, and a chatbot for answering student questions. Developed with natural language processing and intent recognition techniques, PlanIC has the vision of reducing cognitive load, encouraging autonomous learning, and facilitating effective academic planning. This system facilitates peer collaborative learning through its interactive interface and generates organized academic reports for dissemination beyond the platform. The modular architecture of the system enables it to fit within diverse learning environments. Overcoming the silos of conforming academic resources, PlanIC brings together a data-driven platform to personalize the student experience. Current systems are explored in this research, and PlanIC is recognized as a scalable and promising AI-based solution for enhancing academic engagement in higher education.

Keywords – academic assistant, AI in education, study planner, note summarization, chatbot, educational technology.

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Transformer Based Multi Task Learning for MRI Based Detection and Severity Prediction of Mental Illness

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Abstract – Mental illness is one of the most pressing concerns in current human life due to an imbalance of lifestyle and work pressures. The mental illness can also be present from birth. Accurate identification of mental illness and its severity level is most important for better treatment and a possible cure. The estimation of the severity of mental illness by using magnetic resonance imaging (MRI) is still challenging due to limited labelled data and the adoption of techniques. Existing techniques mainly focus on binary classification of disease presence rather than on predicting severity. This paper proposes a novel multi-task deep learning framework for simultaneous mental illness classification and severity level prediction. The proposed model integrates the self-supervised pretraining to learn robust representations from unlabelled MRI data, followed by a hybrid CNN–Transformer architecture to capture both local anatomical features and global structural dependencies. A Transformer-based Multiple Instance Learning (MIL) mechanism aggregates slice-level features into subject-level representations, while region-aware learning and clinical feature fusion enhance interpretability and prediction accuracy. The implementation results have shown better performance by achieving an accuracy of 92.6%, 0.95 AUC, which indicates the effectiveness of the proposed model in predicting both the existence of mental illness and its severity level based on the MRI images.

Keywords – Mental Illness (MI), Magnetic Resonance Imaging (MRI), Multi-Task Learning, Self-Supervised Learning, Transformer-Based Multiple Instance Learning (MIL), Severity Prediction.

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Hybrid Blockchain and AI based Continuous Authentication Framework for Secure Internet of Vehicles

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Abstract – The rapid evolution of the Internet of Vehicles (IoV) needs a strong authentication mechanism as it provides vehicle communication with other vehicles (V2V), infrastructure and cloud-edge system. This environment system supports secure and reliable authentication because it is essential for vehicles to verify the data with whom it is communicating and authentication ensures only legitimate vehicles participate and communication is trustworthy. This paper presents a hybrid blockchain and AI-based continuous authentication framework for secure IoV systems. The proposed model maximizes blockchain for decentralized identity management, as edge-enabled Road Side Units (RSUs) achieve low-latency authentication using lightweight cryptographic methods. In addition, a deep learning-based CNN-GRU model allows continuous behavioral monitoring and outlier detection. The model is evaluated using an artificial environment integrating vehicular flows and network communication models. Experimental analyses show that the proposed framework achieves an average authentication delay of 32 ms, improves the flow rate up to 920 transactions/sec, and reaches a detection accuracy of 96.4%, while minimizing energy consumption by approximately 18% compared to existing techniques. These results focus on the effectiveness of the proposed method in providing a scalable, efficient, and intelligent authentication method for next-generation IoV environments.

Keywords – *Internet of Vehicles (IoV), Blockchain, Continuous Authentication, Edge Computing, Deep Learning, Anomaly Detection.*

Paper ID: ICEMCSI2026-839

A Comparative Study on DDoS Attacks in Disrupting Blockchain Networks

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Abstract – Blockchain technology was developed in 1991 as a means of storing and securing digital data. It is a public ledger that allows multiple parties to view information simultaneously. The fact that data is recorded and hard to change without consent of everyone is one of its key advantages. IBM notes that each new record becomes a block with a unique hash for identification, and these blocks are connected to form a chain of documents. Bitcoin uses blockchain technology, which can help with contract management, product provenance, and multi-step transaction verification and traceability. User-to-user transactions are protected by asymmetric cryptography, and miners verify all transactions sent to the blockchain. DDoS is a very crucial element in the security of blockchain. It can be used as a preventive measure against security vulnerabilities in blockchain technology. This paper discusses two ways DDoS can attack the blockchain.

Keywords – Blockchain; Security; Forking; Supply Chain Management; DDoS attack.

Analysis of Forked Blockchain Hacks in Supply Chain Management

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Abstract – Supply chain management (SCM) increasingly relies on blockchain technology to ensure transparency, traceability, and tamper-resistant record-keeping. However, the adoption of blockchain in SCM introduces significant security vulnerabilities, particularly through forking mechanisms and hash-power-based attacks. Forking—both hard and soft—can fragment the blockchain network, reduce aggregate hash power, and dramatically increase susceptibility to 51% attacks and double-spending exploits. Existing literature addresses blockchain security in isolation, but a systematic framework that models, detects, and mitigates forking-related threats specifically within SCM contexts remains absent. This paper presents a mathematical framework—the Hash-Trust Fork Mitigation (HT-FM) model—that quantifies fork probability using exponential arrival models, formalizes 51% attack risk using hash-power thresholds, and introduces a composite Trust Score for supply chain nodes. The framework integrates a fork detection simulation on a private Ethereum testnet with 100 nodes and evaluates performance across three attack scenarios: transaction flooding, smart contract exploitation, and 51% hash manipulation. Experimental results demonstrate an overall detection accuracy of 94.9%, an F1-score of 95.0%, and a false positive rate of 4.8%, outperforming five state-of-the-art approaches. The proposed framework provides both theoretical rigor and a practical roadmap for securing blockchain-based supply chains against forking attacks.

Keywords – Blockchain; Distributed Ledger Technology; Forking; Supply Chain Management; Hash Power; Trust Modeling; Security.

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AURAGNet: Action Unit Region Attention Graph Network for Facial Expression Recognition

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Abstract – The problem of recognizing human emotions in terms of facial expressions has attracted much attention in recent years. This is because human emotions and their identification have a significant influence on human behavior and communication processes. Nonetheless, unconstrained face recognition under various factors like illumination conditions, pose changes, occlusion, and even emotional differences between expressions still present a significant challenge. Therefore, this research presents AURAGNet, a novel region-aware facial expression recognition architecture based on the integration of hierarchical representation learning by ConvNeXt-Tiny and transformer based cross region interaction modeling and dynamic facial relations learning. In this work, we introduce an action unit region attention (AURA) mechanism composed of facial region partition attention (FRPA), cross region linear transformer (CRLT), and dynamic action unit relation graph (DARG) modules.

Keywords – Facial Emotion Recognition, ConvNeXt-Tiny, Region Attention Learning, Transformer-Based FER, Dynamic Facial Relation modeling.

Passive cursor entropy attack behavioural side channel exploitation in modern web browsers

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Abstract – Modern web browsers continuously collect cursor interaction data to enhance user experience and interface responsiveness. While such telemetry is generally considered transient and non-sensitive, subtle variations in human motor behaviour introduce measurable statistical patterns in cursor trajectories. This work presents a Passive Cursor Entropy framework to evaluate whether entropy-based motion descriptors exhibit consistent similarity across independent interaction sessions. Cursor trajectories are modeled using statistical features such as velocity dispersion, directional entropy, and trajectory curvature, and compared using normalized similarity scoring and Dynamic Time Warping (DTW). Experimental results across multiple sessions indicate that behavioural motion features demonstrate observable similarity patterns under repeated interaction conditions, while remaining distinguishable across dissimilar sessions. These findings suggest that cursor interaction data may act as a probabilistic behavioural side-channel, even in the absence of traditional identifiers such as cookies or local storage. The study highlights the need to consider interaction telemetry within modern browser privacy models and motivates the exploration of privacy-preserving mechanisms for behavioural data streams.

Keywords – Behavioral biometrics, Cursor entropy, Side- channel analysis, Browser privacy, Interaction telemetry.

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Sustainable Solar Energy Harvesting Using Optimized Converter and Intelligent MPPT

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Abstract – This paper discusses an eco-friendly solar system based on optimized design of DC-DC converters coupled with intelligent Maximum Power Point Tracking (MPPT) controller, which employs Slime Mould Algorithm (SMA). The purpose of the proposed design is improvement of energy efficiency from PV cells during various environmental conditions like partial shading or non-uniform irradiance. An optimized design of the DC-DC converter facilitates efficient regulation of voltage, loss reduction due to switches and higher energy efficiency. Intelligent MPPT based on SMA performs effective tracking of the global maximum point in accordance with the oscillation and adaptation foraging principles characteristic of slime mould organisms. Unlike the traditional methods, the algorithm used in this design allows fast convergence speed, minimized oscillations at the steady state and higher tracking accuracy. Simulations reveal that the proposed system has higher efficiency with rapid dynamics and stability in changing atmospheric conditions.

Keywords – PV system, SMA, MPPT, Optimized DC–DC converter, Partial shading.

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Automated Dust Detection in Solar Panel Using Deep Learning Architecture

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Abstract – The dust particles on the surface of solar panels can cause a reduction in energy efficiency by as much as 80%. Therefore, there is a need for an automated system to detect dust particles and determine whether the solar panels need cleaning. An automated system will classify solar panels as either clean or dusty. This paper provides a deep learning approach for classifying the solar panels using ResNet50 architecture. A dataset was compiled from widespread image datasets in various climatic conditions in Tamil Nadu, India. The images were pre-processed and labeled before being split into training, validation, and testing datasets. According to the results of the experiment, ResNet50 achieved a classification accuracy of 97.7%. It is higher compared to other CNN architectures such as VGG16 and InceptionV3. The experiments have demonstrated that the ResNet50 architecture is effective in obtaining a high level of precision in numerous illumination conditions.

Keywords – Solar Panel, Dust Detection, Accuracy, ResNet 50, Precision.

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An Unified Behavioural Intelligence System for Academic Spaces

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Abstract – This paper proposes a Unified Behavioural Intelligence System with the goal of developing a real-time engagement monitoring system to be used in classrooms using Computer Vision and Deep Learning. Through a camera feed, the face of student and teacher are simultaneously analysed by the system and sent to the different processing pipelines. YOLOv8 manages real-time face detection, the CNN/MobileNetV2 model classifies student emotions into engagement categories, MediaPipe Pose assesses instructor posture and gesture. An analytics engine aggregates processed data and calculates engagement scores at the class level and dominant trends of emotion. A role-based dashboard surfaces this data for teachers and the Heads of Department. The proposed architecture is modular, object-oriented and operable without wearing, biometric and hence, addresses a privacy and cost issue discussed in literature. The system provides three types of sessions i.e. theory, tutorial, and lab and gives suggestions for teaching in real-time.

Keywords – classroom engagement, facial expression recognition, YOLOv8, MobileNetV2, MediaPipe Pose, behaviour analytics, teacher recommendation, computer vision.

SustainDiet Pro: An Intelligent Dietary Assistant for Athletes Using Mobile Computing

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Abstract – Traditional nutrition guides often fail to account for the dynamic metabolic demands of competitive sports. SustainDiet solves this by leveraging MET-based metrics to provide real-time, adaptive meal planning. Our core engine utilizes a Random Forest Regressor to determine macronutrient needs, reaching a predictive accuracy of 98.6 percent. To ensure these insights are practical, we deployed a KNN-based recommendation system that suggests meal combinations with a success rate exceeding 90 percent. This dual-model approach creates a sophisticated, data-centric ecosystem that translates complex physiological variables into precise nutritional strategies. For the modern athlete, SustainDiet represents a shift from generalized dieting to an intelligent, automated fueling protocol designed for consistency and athletic longevity.

Keywords – KNN, MSE, Diet Bot, MET, Random Forest Regressor.

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Inclusive Multilingual Conversational AI for Rural Education: A Survey of Offline, Accessible and Explainable Systems

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Abstract – Recent advances in multilingual conversational AI, edge computing, and AI-based assistive technologies have opened new avenues to support education in linguistically diverse and underserved schools. However, the use of conversational AI in rural classrooms is still challenging due to limited devices, accessibility needs and unreliable internet connectivity. The majority of the existing systems focus on high resource languages and well connected settings. In this survey, we review the relevant research published between 2022 and 2025 in four major areas: multilingual educational chatbots; AI for rural and low-resource education; offline and edge-based learning systems; and AI-powered assistive technologies for inclusive education. Around 50-60 relevant studies were found and analyzed along the following dimensions: language support, deployment setting, offline functionality, accessibility, explainability, evaluation methods, and educational domain. The review shows that light weight, localized, and infrastructure-aware multilingual AI systems such as educational chatbots and microlearning platforms are able to boost learner engagement, comprehension, retention, and accessibility. AI-powered assistive tools such as text-to-speech, captioning, adaptive interfaces, and conversational agents also broaden participation for learners with disabilities. Yet few systems achieve successful integration of multilingual support, offline-first design and accessibility and explainability, particularly for rural school contexts. In this paper, we propose a design frame work and future research agenda for inclusive multilingual conversational AI in rural education focusing on offline-first development, accessibility, community collaboration, and responsible AI practices.

Keywords – *Multilingual conversational AI, rural education, offline & edge computing, explainable AI in education, assistive technologies.*

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A 5G enabled wireless sensor network simulation framework for real time traffic monitoring and machine learning based traffic prediction

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Abstract – Rapid growth of cities like Bangalore poses the problem of road traffic management effectively. It is in this scope, that Intelligent Transportation Systems (ITS) are called to assist by providing capabilities of monitoring and analysing real time traffic data. A simulation based approach is described for the combination of 5G-based Wireless Sensor Networks (WSNs) with machine learning methods to predict traffic and provide monitoring. The system performs real-time traffic estimation using both real and synthetic traffic information to emulate virtual sensors nodes across various transport locations in Bangalore. These sensors send vehicles count, speed and locations data information every few seconds through a simulated 5G network emulating extreme reliability and ultra-low latency conditions. A Python simulation engine is employed to simulate the sensor behaviour and communication and a Streamlit dashboard for real-time monitoring of network performance and traffic. The second step in which the Random Forest model is used to forecast future congestion levels. The experimental results reveal that the simulated 5G network has an average latency of fewer than 10 milliseconds in which there is little packet loss, and the prediction model gives accurate predictions of congestion. The results demonstrate that combining 5G-enabled WSNs with machine learning can effectively support smart traffic management in urban environments.

Keywords – 5G, Wireless Sensor Networks, Traffic Monitoring, Traffic Prediction, Machine Learning, Ultra-Low Latency, Streamlit Dashboard, Random Forest.

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Forest Fire Detection and Prevention using Wireless Sensor Networks

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Abstract – Forest fires pose a serious threat to ecosystems, animals, and human life. They can result in significant financial and environmental losses. Early detection and prompt action are necessary to lessen the effects of these disasters. This project looks into the design and implementation of a Wireless Sensor Network (WSN) to detect and stop forest fires in real time. The proposed system strategically places a network of sensor nodes with temperature, humidity, and smoke sensors throughout forest areas to continuously monitor environmental conditions. The sensor data is transmitted wirelessly to a central control unit or cloud-based platform for analysis. Any unusual readings that might point to a fire are instantly reported to authorities by the device, enabling prompt action. Because it offers scalability, low power consumption, and real-time monitoring capabilities, the WSN-based approach is a cost-effective and efficient way to manage forest fires. This project demonstrates how integrating WSN technology into environmental monitoring systems can significantly enhance efforts to prevent disasters and preserve forests.

Keywords – *Wireless Sensor Networks (WSN), Forest Fire Detection, Environmental Monitoring, IoT, Disaster Management, Temperature Sensor, Humidity Sensor, Smoke Sensor, Real-time Monitoring, Cloud Computing, Early Warning System, Low Power Consumption, Remote Sensing, Forest Protection, Fire Prevention.*

Hybrid Measurement-Device-Independent Twin-Field Quantum Key Distribution (MDI-TF-QKD): A Comprehensive Study on Security, Performance and Practical Implementations

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Abstract – Quantum Key Distribution (QKD) is now an essential cornerstone of safe communication, based on quantum mechanical concepts to enable key exchange with information-theoretic security. Most of the traditional QKD protocols suffer greatly, such as being prone to detector side-channel attacks. An important limitation of the traditional QKD protocols is the rate-distance limit, which severely limits their applicability over long distances. In order to eliminate these problems, Hybrid Measurement-Device-Independent Twin-Field QKD (MDI-TF-QKD) has been introduced. This protocol makes use of the best features of Measurement-Device-Independent QKD (MDI-QKD) and Twin-Field QKD (TF-QKD). This article gives an extensive analysis of the hybrid MDI-TF-QKD protocol. It investigates the theoretical background underlying the scheme. It also gives a complete security analysis. The work analyzes the performance of the protocol as well as the practical implementation considerations. Performance evaluations, supported by simulations and experimental results, show that hybrid MDI-TF-QKD achieves significantly higher key rates over longer distances compared to traditional QKD protocols. We also discuss the hardware requirements, experimental challenges, and scalability of the protocol, highlighting its potential for integration into future quantum networks. Finally, we explore future directions, including the integration of quantum repeaters, entanglement-based variants, and satellite-based QKD, paving the way for the widespread adoption of hybrid MDI-TF-QKD in real-world quantum communication systems. This paper shows the transformative potential of hybrid MDI-TF-QKD in advancing secure communication, offering a robust and practical solution for long-distance quantum key distribution in the era of quantum networks.

Keywords – Quantum Key Distribution, MDI-TF-QKD, QKD protocols, hybrid protocol leverages.

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LandReg: A Multi Signature NFT based Blockchain Land Registry and Ownership Verification System

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Abstract – Current land administration frameworks are mostly centralized and rely on physical records, subjecting them to fraud, illegal transfers, and opacity. This work proposes LandReg, a decentralized land registry system deployed on the Ethereum Sepolia test network, which aims to overcome key limitations of existing blockchain-based land registries. The proposed framework adopts ERC-721 tokenization for unique representation of land parcels and uses a 2-of-2 multi-signature approval mechanism requiring both the landowner and an authority to jointly sign transfer requests for secure ownership transfer. The framework also includes an on-chain dispute resolution module to allow automatic transfer prevention when disputes arise, improving security. The system features three interlinked smart contracts working together to provide secure, ownership-controlled transactions and a transparent, immutable audit trail of transactions with time-stamped records. Thorough testing reveals a 100% functional success rate across all tested use cases, with a 13.8% average improvement in gas efficiency over conventional methods. Land registration and transfer processes are completed within a few seconds on the test network, removing the need for intermediaries and processing time. The proposed LandReg system provides secure and transparent land management via verifiable ownership, controlled ownership transfer, and an immutable audit trail, making it a promising step towards decentralized and tamper-proof governance systems.

Keywords – Blockchain Technology, Ethereum, ERC-721, NFT, Land Registry, Multi-Signature, Solidity, Smart Contracts, Sepolia Testnet, Decentralized Systems, Dispute Management.

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Real Time Underground Vibration Detection for Border Infiltration Prevention Leveraging AI and Wireless Edge Sensor Networks

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Abstract – This paper discusses a wireless edge sensor network capable of monitoring underground vibration in real time, categorizing vibrations into human, vehicle, animal, or environmental classifications through the use of AI driven deep learning technology in order to increase the likelihood of identifying and reducing false alerts. The system provides real-time updates and alerting and additionally assists with locating the point of intrusion to support law enforcement agencies and organizations. The design is energy efficient, able to scale as needed, and compatible with existing defense infrastructure. Overall, this new method/approach improves on national security and border defense than any existing method or approach today.

Keywords – Voice-enabled systems, Elderly well-being, Chat-bots, Regional languages, Government schemes, Digital inclusion platform.

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SeniorConnect: A Voice-Enabled Mobile Platform with Regional Language Support for Elderly Well-being and Government Scheme Advisory Across India

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Abstract – India offers a large range of social welfare schemes to improve the lives of its citizens, where many people have some problem and still struggle to access them. Complicated and strong restricted procedures, lack of awareness and consequence, language differences and barriers of language from different locations, and limited digital literacy often cause a problem, where more number of people are less educated and cause of poor to get a education which causes literacy barrier. where project has a chat-bot access for the application where we designed platform easy to understand and easily available schemes. this application will run easily and readily in web and application platform. Its simple, interface feels like that your are talking with real person With multi language support and text-to-speech features, the platform makes sure that all digital literacy also can easily access the app. For all citizens it will give up to date information, the chat-bot empowers them to make informed decisions, active participation in government schemes, and claim their right and correct benefits. It promotes inclusion, transparency, and social development this makes easily approachable and easy access for citizens. The chat-bot provided better access by sharing scheme information in local languages with little effort from users. They could understand eligibility and benefits more clearly through conversation and voice interaction. Early observation show less reliance on intermediaries and quicker access to useful information. Overall, the solution has great potential to raise awareness, inclusion, and practical use of welfare schemes.

Keywords – *underground infiltration-detection, border security, wireless edge sensor networks, vibration monitoring, deep learning (DL) classification, real-time (RT) monitoring.*

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MedIntel: An edge enabled multimodal radiology ai for priority driven clinical decision support

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Abstract – Medical imaging produces large volumes of diagnostic data, especially in hospitals handling continuous X-ray, CT, and MRI examinations. In many cases, scan interpretation depends heavily on radiologists, which can increase reporting delay during high patient load. This work presents MedIntel, an edge-assisted radiology support model developed for anomaly screening, case prioritization, and clinical recommendation generation. The approach combines multimodal scan handling with local AI-assisted processing to reduce dependency on centralized cloud infrastructure. Uploaded scans undergo preprocessing, modality verification, and anomaly mapping before severity estimation and priority assignment. Cases identified with higher clinical risk are flagged separately for rapid review. The model also generates recommendation outputs based on detected abnormalities and affected anatomical regions. Edge deployment using lightweight computing devices enables local execution with lower latency and reduced transfer of sensitive patient data. The study further integrates workflow-oriented functions such as patient record storage, report generation, and follow-up tracking. Experimental observations obtained from controlled multimodal scan inputs showed stable anomaly mapping, reliable prioritization behaviour, and consistent response generation during repeated evaluations. Local execution maintained low processing delay while supporting continuous operation in constrained environments. The proposed approach combines radiology analysis, edge computing, and decision- support functions within a single clinical assistance pipeline. Such integration can support faster preliminary assessment in hospitals, diagnostic centres, and remote healthcare units where specialist availability is limited.

Keywords – Radiology AI, Medical Imaging, Edge AI, Multimodal Diagnosis, Anomaly Detection, Clinical Decision Support, Healthcare Systems.

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Crude Disruption: Wartime Supply Chain Collapse in the Strait of Hormuz and Its Cascading Human Consequences

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Abstract – The armed conflict involving the United States, Israel, and Iran in February 2026 led to the effective shutdown of the Strait of Hormuz, widely recognized as the world's most strategically important energy chokepoint, for international commercial shipping. Disruption represents the most severe interruption to global oil supply ever recorded, impacting nearly 20 million barrels per day (b/d), equivalent to around 20% of worldwide petroleum liquids consumption, in addition to affecting 20% of global liquefied natural gas (LNG) trade. The analysis provides a detailed, data-driven assessment of the supply chain disruptions caused by the closure and the resulting consequences for human welfare. Using real-time information from the U.S. Energy Information Administration (EIA), International Energy Agency (IEA), Kpler tanker tracking services, the United Nations Food and Agriculture Organization (FAO), and the World Bank, we develop a multi-dimensional vulnerability index covering 12 countries across Asia, Europe, and South Asia. The study identifies Bangladesh, Pakistan, and several Southeast Asian countries as facing the most severe combined energy, food, and economic challenges.

Keywords – Strait of Hormuz, supply chain disruption, crude oil, wartime economics, food security, geopolitical risk, strategic petroleum reserves, energy chokepoint, Middle East, LNG, inflation, developing economies.

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Design and Analysis of a Multi-Source Single-Output DC-DC Converter for Electric Vehicle Chargers

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Abstract – As electric vehicles (EVs) become more popular for getting around, the demand for energy-efficient and versatile charging systems has increased. These systems should work with a range of renewable mobile-nations technologies. In this paper, a multiphase DC–DC converter with single output and multiple input (MISO) for charging electric vehicle batteries is proposed. A topology suitable to be used simultaneous with or independently from solar photovoltaic (PV) and grid power is proposed, which renders the charger a robust charging solution without concern of load change and environment conditions. The MISO converter puts the renewable energy at a high priority if it is present, for controlling the transfer of power from inputs to outputs. This is one reason why the grid becomes less important. Simulation studies indicate the voltage in inverter and rotor speed have been analyzed. The findings showed that the configuration would help to make the new system more reliable, allow for (two-way) electricity flow. Hardware setup also implemented with multiple sources like solar and wind for running EV motor. The proposed solution subsidizes to making EV charging as more sustainable by providing advanced control methods to increase energy efficiency or grid stability.

Keywords – DC–DC converter, MISO converter, renewable energy, EV motor.

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Optimal Renewable DG Placement for Loss Reduction and Sustainable Distribution System Development

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Abstract – In this study, the hippopotamus optimizer algorithm (HOA) is strategically mapped to solve the distributed generation (DG) placement and sizing optimization problem for minimizing the active power loss (APL). The HOA effectiveness is realized on the 34-bus IEEE radial distribution grid for single and multiple (three) units of photovoltaic (PV) DGs placement. The benchmark system APL is reduced from 217.01 kW to 95.34 kW and 58.23 kW after the optimal connection of a lone and multiple PV DGs, respectively. Further, the multiple units of optimized PV DGs produced better voltage regulation, registering a 0.0222 per unit (p.u.) higher minimum bus voltage (V_{bus}) profile than single PV DG unit optimization. The simulation study showed promising findings, highlighting the feasibility of the HOA for complex optimization frameworks.

Keywords – Power loss minimization, Bus voltage enhancement, Distributed generation sizing, Optimization.

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Hybrid CNN-BiLSTM Deep Learning Algorithm based Power Consumption Prediction for Accuracy

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Abstract – Accurately forecasting the power consumption may facilitate efficient energy and resource management in smart grid and power management systems. This research suggests a hybrid deep learning-based CNN-BiLSTM technique has to enhance the prediction of electric power demand. This allows the system model to learn the timing and pattern of an event. CNN component is utilized for feature extraction. The BiLSTM model extracts previous and future relations from the specified input sequence. The model learns and evaluates using real demand data, with the fitness of the proposed study is Root Mean Square Error (RMSE). The results show that there is a fast convergence during training, as loss, and RMSE values keep on decreasing and stabilizing at lower or constant values. Here 2/3 of actual demand data used for training and 1/3 demand data used for testing more over Karnataka state takes it as a reference study model. The model gives very precise predictions and is highly reliable as the overall performance is supported by low RMSE value 0.837. The observed RMSE is relatively small signifying that the difference between actual and predicted values is rather less in the testing dataset. Generally, the proposed CNN-BiLSTM hybrid framework outperforms traditional methods and offers a reliable solution for medium-term power consumption forecasting suitable for practical energy management applications.

Keywords – CNN-BiLSTM, RMSE, Hybrid model, Electric demand, predictions.

An Integrated Two-Stage Model Using LSTM Load Forecasting and Crisscross Optimization for Hydrothermal Scheduling

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Abstract – STHTGS refers to Short-Term Hydro-Thermal Generation Scheduling, which has become indispensable in contemporary power systems to provide economical dispatch to meet system demand while adhering to operational constraints. In the practice of scheduling, it is normally believed that the point of scheduling possesses adequate information on the load in the future. However, smart grid applications where high amounts of load uncertainty can be a factor, this would not be the case. The study suggested a hydro thermal scheduling based on Crisscross Optimization (CSO) and a two stage load forecasting based on LSTM. In order to produce more accurate short-term forecasts, the LSTM model first recovers complex nonlinear temporal patterns from historical load data. In the second step, we feed the predicted load profile into the CSO algorithm to tackle the economic dispatch issue in a hydrothermal power system that has non-convexity. The testing of the framework is done on a system consisting of 1 thermal unit and 4 hydro units over a period of 24 hours scheduling. Forecast accuracy is measured by MAE, RMSE and MAPE. The computational time as well as operational fuel cost of the baseline ARIMA-PSO method are used for optimization performance comparison. The simulation results indicate that the proposed LSTM-CSO technique successfully integrates the effective power system scheduling with effective forecasting, resulting in more accurate predictions and reduced operational costs.

Keywords – Long Short-Term Memory (LSTM), Crisscross Optimization, Economic Dispatch, Load Prediction, Smart Grid, Short-Term Hydrothermal Scheduling, and Metaheuristic Algorithms.

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A novel multimodal technique based medical image fusion framework using coupled neural P systems

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Abstract - The fusion technology of imaging modalities has been emerged as a potential tool in diagnosis of diseases such as Acute stroke, Carcinoma, Alzheimer disease & early stages of cancer detection. The primary intention of image fusion is to integrate the specific information to give a complete fused image, which is useful for physicians in clear diagnosis and treat diseases. As many fusion methods suffer from energy loss, poor contrast and brightness. Coupled Neural P (CNP) systems is a collateral model with spiking coupled neurons. This work proposes the CNP systems based fusion strategy of medical images. An image fusion framework is created in the non-subsampled shearlet transform (NSST) domain, utilizing two CNP systems with a local topology to manage the fusion of low-frequency NSST coefficients. The high frequency coefficients are fused by maximum selection rule so as to extract edge, texture details. Finally, the fused image is reconstructed by using inverse NSST. The effectiveness of the proposed fusion technique is assessed using a pair of multi-modality medical images and compared against seven prior fusion techniques. Both quantitative and qualitative experimental findings highlight the superiority of the proposed fusion approach regarding visual quality and fusion effectiveness.

Keywords - Medical Image Fusion, NSST, Coupled Neural P systems, Alzheimer disease.

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