INTERNATIONAL HOUSE OF EDUCATION (IHE)



Proceedings of

INTERNATIONAL SYMPOSIUM ON ARTIFICIAL INTELLIGENCE IN EDUCATION (ISAIED-2026)



2ND MAY 2026

Don Bosco College Of Engineering

Fatorda, Margao, Goa

ISBN: 978-93-5782-039-4

Proceedings of International Symposium on

INTERNATIONAL SYMPOSIUM ON ARTIFICIAL INTELLIGENCE IN EDUCATION (ISAIED – 2026)

2nd May 2026

Organized by:

International House of Education, Bangalore, India

&

Don Bosco College of Engineering, Fatorda, Margao, Goa

ISBN Number: 978-93-5782-039-4

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ISBN: 978-93-5782-039-4

About International House of Education

The International House of Education (IHE) is committed to fostering excellence in education, research, and professional development through global collaboration and knowledge exchange. As an international academic and professional platform, IHE strives to bridge institutions, industry, researchers, and policymakers to address contemporary scientific, technological, and societal challenges.

IHE actively supports initiatives that promote interdisciplinary research, innovation, sustainability, and capacity building across diverse domains of science, engineering, technology, and management. By encouraging scholarly dialogue and inclusive participation, IHE aims to nurture future-ready professionals and researchers who can contribute meaningfully to national and global development.

We are pleased organise **ISAIED 2026**, a symposium that reflects the core values of IHE—academic rigor, innovation, and international cooperation. Such forums provide an invaluable opportunity for researchers, academicians, and practitioners to share insights, present cutting-edge research, and build lasting collaborations.

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ISBN: 978-93-5782-039-4

About Don Bosco College of Engineering

Established in 2011 and affiliated with Goa University, DBCE is a premier technical institution dedicated to excellence in engineering education, research, and innovation. Supported by the global Don Bosco network, it emphasizes holistic development through a blend of technical expertise, ethical values, and leadership.

The institute focuses on industry-oriented learning with modern infrastructure and practical exposure, preparing students for real-world challenges. It also promotes research, innovation, and entrepreneurship, aiming to develop skilled professionals ready to excel in the global landscape.

Don Bosco association with **ISAIED 2026** reflects its commitment to fostering collaboration, promoting high-quality research dissemination, and supporting platforms that bring together academicians, researchers, and industry professionals to address emerging challenges in science and technology.

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Symposium Overview

The International Symposium on Artificial Intelligence in Education (ISAIED–2026) serves as a premier global platform dedicated to exploring the transformative role of artificial intelligence in shaping the future of education. The conference brings together academicians, researchers, industry professionals, and policymakers to engage in meaningful dialogue and knowledge exchange. It aims to foster interdisciplinary collaboration, promote innovative research, and encourage the development of AI-driven solutions that enhance teaching, learning, and educational outcomes across diverse domains.

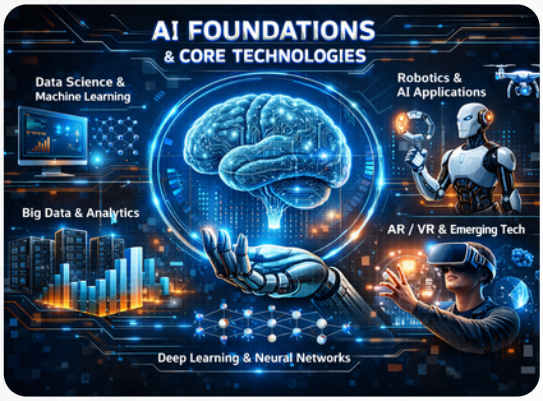
ISAIED–2026 places a strong emphasis on the integration of AI within Science, Engineering, and Technology education. The symposium covers a wide spectrum of disciplines, including Computer Science, Mechanical, Civil, Electronics, Electrical, and Medical Engineering. In addition, it highlights the growing impact of AI in areas such as Digital Marketing and Human Resource Management. Core technical domains such as Data Science, Machine Learning, Deep Learning, Robotics, and AI applications are central to the discussions, along with emerging educational technologies like Learning Management Systems (LMS), Internet of Things (IoT), and smart classrooms.

The conference also focuses on advancing next-generation learning ecosystems through AI-powered tools such as chatbots, intelligent tutoring systems, and generative AI. It explores curriculum innovation for STEM education, the integration of AR/VR and other emerging technologies, and the use of learning analytics and big data to improve decision-making. Furthermore, ISAIED–2026 addresses critical aspects such as ethics, security, and challenges in AI adoption, while aligning education with Industry 4.0 demands, future skills development, and the goal of creating inclusive and accessible learning environments for all.

Symposium Highlights

- **Keynote Sessions by eminent experts**
- **Technical Paper Presentations**
- **Panel Discussions**
- **Networking Opportunities**
- **Research Showcasing on a Global Platform**

Symposium Themes

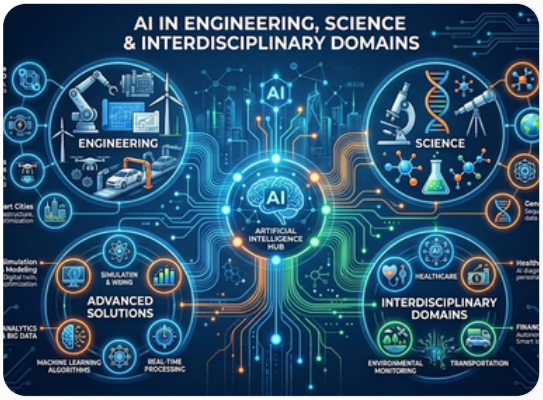


Theme I: **AI Foundations & Core Technologies**

- Data Science, Machine Learning & Deep Learning
- Robotics & Artificial Intelligence Applications
- Learning Analytics & Big Data
- AR/VR & Emerging Technologies

Theme II: **AI in Engineering, Science & Interdisciplinary Domains**

- AI in Science & Engineering Education
- Computer Science, Mechanical Engineering, Electronics & Electrical Engineering
- Civil Engineering, Medical Engineering
- AI in Digital Marketing, Human Resource Management





Theme III: **Smart Learning Ecosystems & Educational Innovation**

- **Technology-Enhanced Learning Systems (LMS, IoT, Smart Classrooms)**
- **AI-Powered Tools (Chatbots, Intelligent Tutoring Systems, Generative AI)**
- **Curriculum Innovation for STEM**

Theme IV: **Future, Ethics & Inclusive AI in Education**

- Ethics, Security & Challenges in AI
- Industry 4.0 & Future Skills
- Inclusive & Accessible Education



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Message from the Patron



It gives me immense pleasure to extend my warm greetings to all participants, scholars, and distinguished guests of the International Symposium on Artificial Intelligence in Education (ISAIED–2026), organized by our institution in association with the International House of Education (IHE)

Artificial Intelligence is transforming the landscape of education at an unprecedented pace, redefining how knowledge is created, delivered, and experienced. Conferences such as ISAIED–2026 serve as vital platforms for intellectual exchange, innovation, and collaboration among educators, researchers, and industry experts from across the globe. I am confident that the deliberations and insights shared during this symposium will contribute significantly to advancing the role of AI in fostering inclusive, adaptive, and future-ready education systems.

I commend the organizers for their dedication and vision in bringing together such a diverse and accomplished community. The compilation of these proceedings stands as a testament to the collective efforts and scholarly contributions of all participants, and I hope it will inspire further research and meaningful applications in this dynamic field.

I extend my best wishes for the grand success of ISAIED–2026 and congratulate everyone involved for their valuable contributions.

Dr.Neena Panandikar
Principal,DBCE
Patron, ISAIED2026

ISBN: 978-93-5782-039-4

Keynote Address

Dr. Praveen M P
Director – Numentrix Consulting LLP



Profile:

Dr. Praveen M P is a distinguished professional and the Director of Numentrix Consulting LLP, bringing extensive expertise in consulting, strategic advisory, and professional services. With a strong academic and industry background, he has contributed significantly to organizational growth, innovation, and capacity building across sectors. He is known for his leadership in delivering high-impact solutions, mentoring professionals, and driving excellence in consulting practices. His work reflects a commitment to innovation, knowledge sharing, and professional development.

He currently involved in the implementation of INVENTRIX an AI based Supply chain solution for Small to medium scale enterprises. Inventrix, aids in planning inventory effectively by forecasting the likely demand and hence reduces or mitigate the risk associated with excess/less inventory.

His dream is to build Intelligent or Smart solutions for various processes associated with Manufacturing from Inventory Management, Human Resource (HR), Predictive Maintenance, Quality and Supply Chain**.**

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Invited Talk - 1

Dr. Santhosh N
Professor, Department of Mechanical Engineering, Dayananda Sagar Academy of Technology and Management, Bengaluru, Karnataka,



Title: From Chalk to Chatbots: Integrating AI Tools for Assessment, Question Design, and Adaptive Learning in Modern Education

Profile:

Dr. Santhosh N is a dedicated academician and Professor in the Department of Mechanical Engineering at Dayananda Sagar Academy of Technology and Management, Bengaluru. With a strong foundation in mechanical engineering, he has been actively involved in teaching, research, and mentoring students at both undergraduate and postgraduate levels.

His academic interests include core areas of mechanical engineering, and he has contributed to the field through research publications, technical guidance, and participation in academic initiatives. Dr. Santhosh is known for his student-centric approach, commitment to academic excellence, and continuous efforts toward innovation and skill development in engineering education.

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Invited Talk - 2

Dr. S. Sudhagara Rajan
Associate Professor, Department Aerospace Engineering, REVA University – Bangalore



Title: Artificial Intelligence in Aerospace Engineering: From Automation to Autonomy

Profile:

Dr. Sudhagara Rajan S. is an Associate Professor in the Department of Aerospace Engineering, School of Mechanical Engineering, REVA University, Bengaluru. He holds a Ph.D from Vellore Institute of Technology (VIT), where his research focused on laser and shot peening effects on the fatigue behaviour of aerospace-grade Ti-15-3 alloy. His expertise lies in laser surface modification, aerospace materials, tribology, Aerodynamics and additive manufacturing. He previously served as a JTEE-CAPES Young Talent Research Fellow (Post-Doc) at UNESP, Brazil, and completed part of his doctoral research at the University of Tours, France, under the ERASMUS+ program. He has also contributed to ISRO-VSSC funded research projects. With over 14 years of teaching and research experience, he has published extensively in reputed international journals and presented his work at global conferences. His current research emphasises advanced

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surface engineering solutions for enhancing the durability and reliability of next-generation aerospace components.

Invited Talk - 3

Dr. Nilam Choudhary
Associate Professor, Computer Science and Engineering Department, Swami Keshvanand Institute of Technology Management & Gramothan, Jaipur



Title: Design Thinking in Product Development: Unlocking Innovation with AI
Profile:

Dr. Nilam Choudhary is an Associate Professor in the Department of Computer Science and Engineering at SKIT, Jaipur, with over 19 years of academic and research experience. She holds a Ph.D. in CSE and specializes in Cloud Computing, Cyber Security, IoT, and Image Processing. She has published 45+ research papers, holds five patents, and has received major funding for AICTE IDEA Lab and MSME innovation projects. She is the Innovation Cell and IDEA Lab Coordinator and has delivered several sessions at conferences on innovation, design thinking, and entrepreneurship. A Senior Member of IEEE, she actively contributes to research, professional development, and academic leadership.

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Invited Talk - 4

Dr. Prashanth K P
Professor, Department of Mechanical Engineering, Acharya Institute of Technology, Bengaluru, Karnataka, INDIA.



Title: "Impact of Artificial Intelligence in Mechanical Engineering Education
Profile:

Dr. Prashanth K P is an accomplished academician serving as Professor in the Department of Mechanical Engineering at Acharya Institute of Technology, Bengaluru. He brings extensive experience in engineering education, research, and academic leadership, contributing significantly to the development of future engineers.

His areas of expertise span core mechanical engineering disciplines, with active involvement in research publications, curriculum development, and technical mentoring. Dr. Prashanth has played a key role in guiding student projects, fostering innovation, and promoting industry-oriented learning practices.

He is recognized for his commitment to academic excellence, collaborative research initiatives, and continuous efforts toward enhancing the quality of engineering education through knowledge dissemination and professional engagement.

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ISBN: 978-93-5782-039-4

ABSTRACTS

ISAIED2026/01

Deep Learning Framework: Forged Region Detection in Medical Images Using a Hybrid ResNet-101 and DenseNet-121

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Abstract

Medical image forgery poses a serious threat to clinical diagnosis and forensic investigations. Detecting forged regions at the pixel level remains a challenging problem due to subtle manipulations and post-processing operations. In this paper we propose a hybrid deep learning framework for forged area detection in medical images using the BIOFORS dataset. The proposed model integrates ResNet-101 and DenseNet-121 as dual encoders within a U-Netbased segmentation architecture. ResNet-101 captures high-level semantic inconsistencies while DenseNet-121 preserves fine-grained texture details through dense feature reuse. A feature fusion strategy is employed to accurately localize forged regions. Experimental results demonstrate that the proposed hybrid model significantly outperforms single-encoder baselines in terms of Dice coefficient, Intersection over Union (IoU) and pixel-level accuracy making it suitable for medical and forensic applications.

Keywords: Medical Image Forgery, Forged Area Detection, BIOFORS Dataset, ResNet-101, DenseNet-121, Deep Learning, Image Segmentation.

ISAIED2026/02

The AI-Risk Imbalance: A Mathematical Framework Demonstrating Why Risks Outpace Benefits in Artificial Intelligence Deployment

Chandrakant Naikodi #1 , Mr. J. Chandrashekhara #2 , Mr. Mahammad Ismail Jabiulla #3
Professor #1 , PhD Scholar #2 , PhD Scholar #3

ISBN: 978-93-5782-039-4

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Abstract

The deployment of Artificial Intelligence (AI) systems at scale presents a fundamental tradeoff between societal benefits and compounding systemic risks. This paper constructs a rigorous mathematical framework to model, quantify, and compare these opposing forces. Through the introduction of the AI Benefit-Risk Imbalance Function (BRIF), cumulative risk divergence models, adversarial amplification theory, and entropy-based harm propagation analysis, we demonstrate that under realistic operational conditions, the aggregate risk trajectory of AI systems grows super linearly while benefits saturate logarithmically. Our central theorem the Risk Dominance Theorem formally proves that for sufficiently large deployment scales and capability levels, the net social utility of AI becomes negative unless constrained by bounded regulatory intervention. Empirical parameterization using published data on bias incidents, misinformation propagation, adversarial misuse, and capability growth confirms that risks are not merely competitive with benefits but are winning decisively.

Keywords: Artificial Intelligence, Risk Analysis, Benefit-Risk Tradeoff, Mathematical Modeling, AI Safety, Social Utility Functions, Superliner Risk Growth

ISAIED2026/03

Integrating Artificial Intelligence in Materials Science: Improving Teaching, Learning, and Research

Dr. Mir Waqas Alam
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Abstract

Artificial Intelligence (AI) is playing an important role in changing how we teach, learn, and perform research. In my research work, I have mainly focused on materials science, especially thin films, nanomaterials, energy devices, sensors, and environmental applications. Over the years, this work has involved a large number of experimental studies, device fabrication, and performance analysis across different types of functional materials. Recently, AI and machine learning have been introduced into this research to support better understanding and faster decision-making. Instead of relying only on experiments, AI models can analyze large datasets from previous studies and help predict material behavior and device performance. This makes it easier

ISBN: 978-93-5782-039-4

to identify suitable materials, optimize properties, and reduce time and cost in research. Another important aspect is the use of explainable AI methods, which help in understanding how different material parameters affect the final results. This is very useful not only for research but also for teaching, as students can clearly see the relationship between theory, data, and real-world applications. It improves their learning experience and helps them develop practical understanding without depending only on laboratory work. My overall research work combines experimental materials science with data-driven approaches, covering areas such as photocatalysis, energy storage, sensors, and environmental applications. The integration of AI in these areas supports interdisciplinary learning and helps students and researchers connect physics, materials science, and data science in a simple way. This work shows that AI can be used as a powerful tool to improve teaching methods, support research activities, and build a more interactive and modern learning environment. It also highlights the importance of combining traditional scientific knowledge with new digital technologies to meet the future needs of education and research.

Keywords: Artificial Intelligence (AI), Machine Learning (ML), Explainable AI (XAI), Materials Science, Nanomaterials, Thin Film Technology, Data-Driven Research

ISAIED2026/04

Konkani LLM: Multi-Script Instruction Tuning and Evaluation for a Low-Resource Indian Language

Reuben Chagas Fernandes
Computer Engineering, Don Bosco College of Engineering, Goa, India

Abstract

Konkani is a scheduled Indo-Aryan language spoken along the western coast of India that remains severely underserved in the modern AI landscape with no publicly available instruction-tuning datasets or fine-tuned generative models prior to this work. This project was undertaken to fill that need through the creation of Konkani-Instruct-100k, a large-scale synthetic dataset balanced across three official scripts namely Romi, Devanagari and Kannada and the subsequent fine-tuning of six open-weight models from the Llama 3.1, Gemma 3 and Qwen 2.5 families using Low-Rank Adaptation. The resulting Konkani LLM suite supports conversational interaction, English translation and cross-script conversion across all three scripts. Fine-tuned models greatly outperform their base counterparts and compete closely with leading proprietary systems on Konkani tasks. All models and datasets are publicly released on Hugging Face and deployed through a web application at Konkani app and a Flutter mobile application on the Google Play Store.

ISBN: 978-93-5782-039-4

ISAIED2026/05

The Role of Artificial Intelligence in Achieving Sustainable Waste Management: A Review of Recent Advancements and Future Research Directions

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Abstract

The problem of having too much Legacy Waste (LW) in our environment is becoming a significant threat to our planet, our well-being and the economy. Air pollution, water quality issues, contamination of our soil and the potential of fires are just some of the ways that we can be affected. As an additional complication, traditional means of waste disposal often led to an increased level of waste in our environment, with added levels of expense/cost and the risk of danger associated with those costs. This paper will provide a synthesis of 28 newly produced articles (2022-2025) and provide an analysis of how Artificial Intelligence (AI), computer vision, image processing and remote sensing methods are being used to help to transform the Legacy Waste (LW) issue into sustainable and driven by data management processes. Three areas of technological advancement will be presented in this analysis; (i) In terms of achieving Waste identification and Classification through the use of AI driven waste detection systems through the use of deep learning model methods including but not limited to YOLOv and CNN's) achieving an accuracy rating of high mAP value (up to 89.2%); (ii) In terms of predicting calendaric value for Energy Recovery with machine learning techniques (including but not limited to ANN and Extra Trees) for very high accuracy results and (R2 value of up to .979) indicative of a more cost effective alternative than lab analysis; and (iii) The monitoring on large scales from Satellite imagery and Life Cycle Assessment methods provide data about the efficiency of Biomining as well as the impact on the environment. Our synthesis of 28 articles highlights critical areas needing research and gives direction to important areas that will be needed to produce a Hybrid vision system by providing standards for LW images.

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Keywords: Legacy Waste, Image Processing, Deep learning, biomining.

ISAIED2026/06

Reimagining Physics Education through Artificial Intelligence: A Critical Literature Review

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a Department of Physics, Shri Shivaji Science College, Amravati, 444603, Maharashtra, India
b Department of Studies in Chemistry, Shivangangothri, Davangere University, Davangere, 577007, Karnataka, India

Abstract

The integration of Artificial Intelligence (AI) into education is opening new pathways for improving how physics is taught and understood. Physics, often considered conceptually challenging, requires methods that can address individual learning differences and promote deeper comprehension. AI-based tools such as smart tutoring systems, simulation environments, and data-driven learning platforms are helping to create more flexible and student-centered learning experiences. This review presents a critical examination of existing research on the use of AI in physics education, with special attention to its role in simplifying complex concepts, supporting independent learning, and enhancing classroom interaction. The paper also discusses how AI contributes to continuous assessment and timely feedback, enabling both students and teachers to monitor learning progress more effectively. At the same time, it considers important concerns such as unequal access to technology, the need for teacher training, and issues related to data use and ethics. By bringing together insights from different studies, this review outlines the current status of AI applications in physics education and suggests possible directions for future development. The aim is to provide a clear understanding of how AI can be used thoughtfully to improve both teaching practices and learning outcomes in physics.

Keywords: Artificial Intelligence, Physics Teaching, Virtual Simulation, Digital Evaluation.

ISAIED2026/07

Evaluating AI's Role in Visualizing the Evolution of Goan Culture and Learning

Dr.Rita Braganza, Associate Professor, Department of History, Rosary College of Commerce and Arts, Navelim, Goa
Dr.Gaurang S Patkar, Professor, Department of Computer Engineering, Don Bosco College of Engineering, Goa
Dr.D S Vidhya,Associate Professor,Department of Electronics & Computer Science, Don Bosco College of Engineering, Goa

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Abstract

The purpose of history is to illustrate the general progress of society, and the changes and pursuits of men. This change was triggered by several factors from pre-liberation to post-liberation Goa. The source of innovation in ideologies resulted from the socio-political scenario which is highlighted in the literary sources. A historical exploration will unfold events throwing light on the trends and patterns in the evolution of goan ethos. For the historian Knowledge, Evidence and Language is very crucial and reconstructionism determines that there should be a match between the word and the world. The study will enhance knowledge in the historical and political factors that have nurtured the Goan society, the synthesis of ancient and modern culture that evolved in Goa, trace the growth and development of learning from Portuguese Goa to Goa since liberation, and how modernity has imbibed Indian culture in Goa. The incorporation of Generative AI (GenAI) into undergraduate history programs to teach history about Goa will make it easier to go from thinking about history in abstract terms to feeling like you are there. Our study shows that AI tools has helped students bridge the temporal gap by turning static historical data into vivid, lived experiences that improve both emotional resonance and long-term cognitive retention. This is done by combining different primary sources into coherent, interactive narratives.

ISAIED2026/08

Implication of usage of AI technologies on environment

H. C. Ananda Murthy*, Kaupa Philip

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Abstract

Climate change, energy, and the environment are the three main environmental scientific and engineering fields that are being negatively impacted by the use of AI. Artificial intelligence (AI) has substantial environmental effects that occur throughout the AI lifetime. Capturing, minimizing, and controlling the environmental effects of AI as well as its environmentally beneficial applications have an impact on how AI affects the utilization of energy, water, land, and resources. The usage of fossil fuel-derived AI energy increases global greenhouse gas (GHGs) emissions, which in turn accelerates climate change and causes anthropogenic global warming. It is evident that AI applications consume a lot more energy than other technologies, especially when it comes to generative AI. Energy systems will find it difficult to handle the enormously higher power consumption of the next generation of generative AI systems. Future home water supplies could

ISBN: 978-93-5782-039-4

be threatened by the large volumes of water consumed by data centers and high-performance computer facilities that use AI. Two strategies to better capture how AI affects the environment are increased transparency and upholding standards. Numerous ecologically beneficial applications of AI technologies are possible. These applications involve using AI to prevent, lessen, or minimize the detrimental effects that human industry and economic activity have on the environment.
Keywords: AI, Data centre, Greenhouse gas, Climate change, Energy, Environment.

ISAIED2026/09

LSTM-Based Deep Learning Model for Air Quality Prediction Using Time- Series Environmental Data

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Abstract

Accurate air quality prediction is essential for effective environmental monitoring and public health management. This study presents a Long Short-Term Memory (LSTM)-based deep learning model for forecasting air quality using synthetic time-series data comprising temperature, humidity, and PM2.5 concentrations over a two-year period. The primary objective of this work is to develop a reliable predictive model capable of capturing temporal dependencies in air pollution data. Experimental results demonstrate that the model achieves high prediction accuracy, with a strong correlation observed between actual and predicted PM2.5 values. For instance, on February 6, 2026, the model forecasts a PM2.5 concentration of approximately [insert value] µg/m3, categorized as [insert category, e.g., “Moderately Polluted”], indicating its effectiveness in real-time air quality assessment and health risk evaluation. Key contributions of this work include efficient data preprocessing, time-series modeling using LSTM networks, normalization to handle data variability, and inverse transformation to obtain real-world values. Furthermore, the proposed approach is adaptable to real-world datasets obtained from sources such as the Central Pollution Control Board (CPCB) Air Quality Index API. However, the performance of the model is highly dependent on the quality and availability of input data. Issues such as missing values, sensor inaccuracies, and inconsistent data collection may affect prediction reliability.
Keywords: Air Quality Prediction, LSTM, PM2.5, Time-Series Analysis, Deep Learning.

ISBN: 978-93-5782-039-4

ISAIED2026/10

E- Commerce customer lifetime value prediction & analytics platform using RFM and ML

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Abstract

Customer retention is a critical factor for business sustainability, especially in competitive markets. This study focuses on analysing customer behaviour using RFM (Recency, Frequency, Monetary) analysis combined with machine learning techniques to predict Customer Lifetime Value (CLV). The research utilizes transactional data to segment customers based on their purchasing patterns and identify high-value and at-risk customers. Initially, data preprocessing techniques such as cleaning, transformation, and feature engineering are applied to prepare the dataset. RFM analysis is then performed to categorize customers into meaningful segments. Further, machine learning models are implemented to predict CLV, enabling businesses to make data-driven decisions for targeted marketing and customer retention strategies. Model performance is evaluated using appropriate metrics such as R2 score, MAE, and RMSE to ensure accuracy and reliability. The results demonstrate that integrating RFM analysis with predictive modelling significantly improves the identification of valuable customers and enhances business decision-making. This approach helps organizations optimize marketing efforts, improve customer engagement, and maximize long-term profitability.

Keywords: Customer Lifetime Value (CLV), RFM Analysis, Machine Learning, Customer Segmentation, Predictive Analytics

ISAIED2026/11

A Comparative Study of MongoDB and PostgreSQL: Architecture, Performance, Scalability, and Real-World Applications

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Abstract

So, yeah, the massive spike in digital data of late has completely reversed the way that companies manage their databases. We've been talking about how traditional relational systems - those traditional RDBMS stuff that your guy in the front is always going on about - they kind of been the backbone of businesses for like forever, and that's because they give us organized storage, they give us kind of good consistency and our sales transactions are safe. But with the advent of large web applications, cloud technology, big data processing, and real-time distributed applications, NoSQL databases have become the industry's choice. The largest rivals here are MongoDB, which stores the data in documents, and PostgreSQL, which is a powerful open source relational system. For this paper I'm spanning a ton of technical and practical fronts to compare MongoDB and PostgreSQL in terms of: architecture, data modeling, query languages, indexes, speed, how the, how do they scale, and consistency, security, backup, real use cases in businesses, and more. The idea is to enable your classmates (or anyone you want to) gain a sense of when each system performs well (or does not) based on various work loads. What we's found is that MongoDB just rocks when it comes to more flexibility in schema, the ability to scale up in the horizontal direction and also rapid iteration, so this is very much more ideal for the new-age projects that are distributed for cloud-native. PostgreSQL, on the flip, wins in data integrity, complicated relational queries, and strict referrals of the map- ping transaction on mission-critical applications; making it ideal for finance, enterprise, and mission-critical apps.

ISAIED2026/12

AI-Based Smart Plant Disease Detection System Using Image Processing Techniques

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Abstract

Agriculture plays a vital role in ensuring global food security, yet plant diseases continue to cause significant losses in crop yield and quality. Traditional methods of disease detection rely on manual inspection by experts, which is time-consuming, labor-intensive, and prone to human error. To overcome these limitations, this system leverages artificial intelligence and digital image processing to provide faster and more accurate detection. This paper presents an AI-based smart plant disease detection system using

ISBN: 978-93-5782-039-4

image processing techniques in which the proposed system captures images of plant leaves and processes them through several stages, including image enhancement, segmentation, and feature extraction. Key features such as color, texture, and shape are analyzed to identify disease patterns. A deep learning model, specifically a convolutional neural network (CNN), is used to classify the diseases based on trained datasets of plant images. The system is designed to be user-friendly and accessible through mobile or web applications, allowing farmers to upload images and receive quick diagnoses along with suggested remedies. This approach enables early detection of diseases, reduces dependency on expert consultation, and minimizes excessive pesticide usage. Overall, the proposed solution offers a cost-effective, scalable, and efficient method for improving crop health and supporting sustainable agricultural practices through the integration of AI technologies.

ISAIED2026/13

A Lightweight Feature Selection-Based Intrusion Detection Framework for IoT Networks

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Abstract

Most of these types of businesses use the IoT, and this simplifies the lives of people. Many IoT technology has been employed, hence securing such systems against cyberattacks has become quite critical to lecturers. The IoT platforms lack significant storage and processing capabilities, thus they are not well secured and prone to malware and tools. The existing IoT-based intrusion detection systems are most effective at detecting certain malicious intent, or require highly complex models and large amounts of processing capabilities to achieve a high detection rate. These are BoT-IoT, MedBIoT, and MQTT-IoT-IDS 2020 datasets. We have a large number of algorithms, such as DT, RF, KNN, XGBoost, DNN, CNN, and more sophisticated ones, such as Stacking Classifier (DT + RF with LightGBM) and CNN + LSTM. All in all, the Stacking Classifier performed the best. It was more precise, accurate, recallable and had high F1 score. In BoT-IoT and MedBIoT Stacking Classifier was 100 percent accurate and in MQTT-IoT-IDS 2020

ISBN: 978-93-5782-039-4

was 92.3 percent accurate. This goes a long way to overcome the resource issues that IoT intruder detection has. This way increases the security of the IoT devices more quickly and easily.

Keywords: Attack process analysis, Internet of Things (IoT) malware, machine learning (ML) algorithms, network traffic classification, semantic-level features".

ISAIED2026/14

Synthesis, Characterization and Structural analysis of Bismuth Magnesium Tungstate by Machine Learning Approach

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Abstract

Bismuth-based metal tungstates have emerged as promising multifunctional materials due to their unique physicochemical properties, including high structural stability, tunable band gap, and superior electrochemical performance. In this study, bismuth magnesium tungstate nanostructures were synthesized using a controlled wet-chemical approach to achieve phase purity and optimized morphology. The synthesized material was systematically characterized using advanced analytical techniques, including X-ray diffraction (XRD) for phase identification, Fourier transform infrared spectroscopy (FTIR) for functional group analysis, UV–visible diffuse reflectance spectroscopy (UV–DRS) for optical band gap estimation, and electron microscopy for morphological evaluation. Beyond conventional characterization, a machine learning (ML)-assisted framework was implemented to establish structure–property correlations and predict key structural parameters. Experimental datasets obtained from characterization techniques were used to train supervised learning models, enabling accurate prediction of crystallite size, lattice strain, and phase evolution. Feature importance analysis revealed the significant influence of synthesis parameters such as precursor concentration, pH, and calcination temperature on the structural integrity and crystallographic orientation of the material.

The integration of ML techniques not only enhances the reliability of structural analysis but also reduces experimental complexity and optimization time. The proposed approach demonstrates a data-driven

ISBN: 978-93-5782-039-4

pathway for the rational design and accelerated discovery of ternary tungstate materials with tailored properties. This study provides new insights into the synergy between experimental materials science and artificial intelligence, paving the way for next-generation functional materials in energy storage, catalysis, and sensing applications.

Keywords: Bismuth Magnesium Tungstate, Machine learning, Data-driven materials design

ISAIED2026/15

Aerodynamic Performance Optimization of 155mm Artillery Shell Using CFD Analysis and Machine Learning-Assisted Surrogate Modeling Across Full Flight Regime (Ma 0.5–2.5)

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Abstract

The aerodynamic performance of artillery projectiles is a critical determinant of operational range, terminal accuracy, and flight stability. Conventional 155mm artillery shells incur significant drag penalties arising from suboptimal nose geometry and the absence of base drag reduction features, particularly across the transonic and supersonic flight regimes. This study presents a comprehensive computational fluid dynamics (CFD) investigation of a standard 155mm artillery shell and a geometrically optimized variant, incorporating a secant ogive nose profile and a parametrically varied boat-tail configuration. Simulations are conducted using ANSYS Fluent with the SST k-ω turbulence model across a full flight Mach range of 0.5 to 2.5, capturing subsonic, transonic, and supersonic aerodynamic behavior. Key aerodynamic coefficients—including drag coefficient, lift coefficient, and pitching moment coefficient—are extracted and compared between the baseline and optimized geometries. A machine learning-based surrogate model, developed using polynomial regression trained on CFD-generated data, is employed to map the geometric design space and predict the optimum combination of boat-tail angle and length for minimum drag. The surrogate model enables rapid exploration of the design space beyond the computed CFD cases, identifying geometry configurations that maximize aerodynamic efficiency. Results demonstrate that the optimized geometry achieves measurable drag reduction across the full flight envelope, with the most

ISBN: 978-93-5782-039-4

significant gains observed in the transonic and low supersonic regimes. The proposed CFD-ML framework offers a computationally efficient methodology for artillery shell design optimization with direct implications for extended operational range and improved ballistic performance.

Keywords—Artillery shell aerodynamics, computational fluid dynamics, ANSYS Fluent, drag optimization, surrogate modeling, machine learning, SST k-omega, ballistic performance

ISAIED2026/16

Career Connect: AI-Driven Smart Job Portal

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Abstract

Finding a job in India is like completing a jigsaw puzzle with a million pieces to fit. Year after year, line upon line of aspirant's hound for positions posted on a plethora of websites, some maintained by companies, others by state agencies. Keeping up means juggling different accounts. Notices town you from all directions – emails, SMS alerts, portal dashboards – disorganization is inevitable. Each application requires you to submit customized documents. Resumes are rewritten endlessly just to fill out forms. The majority of systems are screening people with primitive word matches. Just because a machine spots words doesn't mean it grasps meaning. What we've got instead is something made piece by piece, line after line - CareerConnect - not shaped by ideas but built from actual programming. Pulls together job openings, whether government or corporate. The tech behind it? Data slips into MongoDB without a sound. When requests arrive, Express.js answers - calm, steady. What shows up on screen comes from React.js, moving fast, staying sharp. Under everything, Node.js keeps the rhythm going. Ten tools once handled this work. Now just one does. Meaning matters more than words alone, guided by BERT and tags built for jobs.

Every piece of a resume gets pulled apart first. Then it's rebuilt carefully so job bots won't ignore it. A system built on numbers uses old choices to quietly suggest spots people might like. Hidden gears turn each time, shaping unseen fits based on what came before. Out of nowhere, data slips in via API hooks - while tiny bits get plucked from government sites when the timer hits zero. Each piece lands without warning, stitched together by routine. By comparing page fingerprints, it skips repeats without extra effort. Midway through sign in, split tokens spark data locks. Saved info gets scrambled right on the devices before storage kicks in. Information travels through shielded paths

ISBN: 978-93-5782-039-4

once it moves. Lighter than outdated methods piling up elsewhere, this approach slides applicants faster toward evaluation eyes. Brief delays shrink when systems run lean like this. Hidden hints inside numbers suggest smarter choices emerge when tools help guide decisions – without steering them.

Keywords: MERN Stack, Semantic Job Matching, Resume Tailoring, NLP, BERT, ATS Optimisation, Government Employment, Collaborative Filtering, Job Aggregation, Indian Recruitment Ecosystem.

ISAIED2026/17

Enhancement in Load Forecasting using Artificial Neural Network

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Abstract

This paper employs Artificial Neural Networks (ANN) to forecast short-term electricity demand for large-scale power systems. The methodology recognizes distinct consumption trends, categorizing them into weekdays and a "weekend" group that incorporates Saturdays, Sundays, Mondays, and government holidays. The study proposes a nonlinear load model and evaluates different ANN configurations, specifically testing architectures with one or two hidden layers and varying neuron counts using historical data as inputs. Results indicate that organizing the neural network according to these specific load patterns yields high-quality forecasts. Measured by Mean Squared Error (MSE), the hourly peak load predictions for the following day demonstrate strong alignment with actual utility data. This robust approach facilitates more effective daily operational planning, directly contributing to the overarching goals of increasing the efficiency, economic performance, and service quality of modern power systems through precise consumer demand projections. The results shows the mean absolute percentage error between actual data and predicted data for a week this prediction of load after application of neural network and its residual difference between actual and predicted values the mean absolute percentage error is found to be 2.74%.

Keywords: ANN, MSE, Load forecasting.

ISAIED2026/18

Machine Learning Based Rapid Detection of Food Adulteration Using Sensor and Image Processing

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Abstract

Food adulteration has grown into a critical global crisis, posing severe risks to public health while concurrently undermining the economic integrity and authenticity of the global food supply chain. The identification and prevention of these fraudulent practices are supreme for ensuring food safety. Diarrheal diseases remain the most prevalent consequence, affecting million individuals and causing deaths every year. To address these tasks, this research suggests a sophisticated multi methodological framework for the rapid detection of intentional adulterants. The study proposes distinct technical approaches Photo Spectrograph Method utilizing sensor-based data collection and machine learning classification. The LSTM classifier yielded a 65% accuracy rate with real-time samples, while the image processing based SVM and MobileNet architectures achieved 80% accuracy in detecting chili adulteration. By conducting a rigorous comparative analysis of performance metrics such as precision, recall and F1-score, this study identifies the most effective machine learning models for food safety applications. Ultimately, the development of portable, sensor integrated hardware serves as a vital supportive tool for on-site testing, bridging the gap between laboratory analysis and real-world market monitoring to safeguard the global population.

ISAIED2026/19

Validation of Integrated Pollution Assessment (IPA) Algorithm for Real Time Monitoring of Industrial Wastewater and Airborne Emissions through Simulation Approach

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Abstract

Industrial growth has led to a significant rise in harmful pollutants being released into water sources and the air, creating serious environmental and public health concerns. Traditional pollution monitoring approaches are often

ISBN: 978-93-5782-039-4

manual, expensive, and unable to deliver continuous real-time tracking. To address these limitations, this paper presents an efficient IoT based monitoring system built on a LPWAN framework for real-time industrial wastewater and air pollution monitoring. The proposed system integrates multi-parameter sensor nodes for wastewater analysis, measuring pH, turbidity, dissolved oxygen, electrical conductivity, and temperature. It also includes air quality sensing capabilities that track PM2.5, PM10, CO, NO2, SO2, temperature, and humidity. To support a combined environmental assessment, a new Integrated Pollution Assessment Algorithm (IPAA) is introduced. This algorithm converts different sensor readings into normalized values, calculates weighted sub-indices for both water and air pollution, and then generates a unified Integrated Pollution Index (IPI) using a convex aggregation method. The mathematical design of the model ensures the final index remains stable, bounded, and easy to interpret. This allows pollution levels to be classified accurately and supports automated alert generation when harmful thresholds are exceeded. The paper also discusses advanced enhancements using fuzzy logic and machine learning-based nonlinear models to improve system robustness and reduce false alarms. Additionally, predictive time-series models are explored to support early warnings before major pollution incidents occur. The LPWAN based architecture enables long-range communication while consuming minimal power, making it well suited for scalable deployment in industrial environments. Simulation-based testing confirms strong communication reliability and overall system efficiency. Results show an average packet delivery ratio of 97.6%, end-to-end latency of 1.8 seconds, average node power consumption of 42 mW, and an overall pollution index estimation accuracy of 95.2%.

ISAIED2026/20

Design of an Improved Diffusion Driven Adaptive Validation Framework for Intelligent Test Case Generation in IoT Software Systems

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ISBN: 978-93-5782-039-4

Abstract

The increased complexity and diversity of IoT software require sophisticated, flexible methods that can generate adaptive test cases based on real-time data from dynamic environments in order to identify defects in these systems. Current methods are typically based on fuzzing (typically using some type of rules), symbolic execution or static generative models; while they have many advantages over prior testing methodologies, there are significant limitations due to limited coverage, weak semantic validity and poor adaptation to changing protocols. In this research, we describe a novel closed-loop Diffusion Driven Validation Framework which integrates a number of modules: DDTCG-Net for generating structured test cases, CTS Align for aligning constraints temporally, SVR TraceGraph for analyzing fault propagation via graphs, ACRL Refine for optimizing the generated test cases by reinforcing optimal paths and UMF Fusion Validator for validating test results under uncertainty in multiple modalities. Each of the modules were selected specifically to address particular shortcomings of current approaches to software testing; together they enable self-refining test generations that are highly fidelity, context aware and diverse for real-time scenarios. The proposed framework will increase the diversity of tests produced as well as reduce the likelihood of protocol violations and improve the accuracy of fault localization. Collectively, these features establish a novel and robust paradigm for Intelligent IoT Software Testing with direct implications for both the reliability and security of IoT devices & deployments.

Keywords: Diffusion Models, IoT Software Testing, Test Case Generation, Reinforcement Learning Optimization, Uncertainty Aware Validation, Analysis.

ISAIED2026/21

An AI based Framework for Tomato Leaf Disease Detection and Classification Using CMYK, Segmentation and Lightweight CNN Model

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Abstract

Tomato crop infections have decreased the plant yield and quality subsequently, causing financial loss to the planters and agriculture experts. Therefore, accurate and primary AI based investigation of tomato crop diseases is vital for agriculture. This research work develops a deep learning (DL) grounded architecture for computerized prediction of eight different

ISBN: 978-93-5782-039-4

classes of tomato leaf diseases. Bilateral filtering acts as a preprocessing stage, to conquer noise while keeping the boundaries and edges in tomato leaf images. CMYK color model mainly focuses on transforming the preprocessed images to chromatic variations as associated with infected regions. Later the background and foreground part of the images are highlighted using OTSU segmentation technique. DL algorithms like ResNet110, ResNet50, InceptionV3, EfficientNetV2 and MobileNetV2, are used for training the model using dataset and their performances were compared. Based on previous related work and model features, MobileNetV2 has proved to be better computationally effective as compared to other methods, whereas ResNet50 and ResNet110 offers highly complex and deep architecture, which might be unsuitable for the hardware designing and real time development. Experimental outcomes prove that both models achieve good accuracy, while MobileNetV2 is best suitable for real-time deployment on resource-constrained approaches such as Raspberry Pi. The proposed framework suggests an effective and scalable solution for intelligent tomato disease monitoring for farmers.

Keywords: Tomato leaf disease detection, Deep learning, Bilateral filtering, CMYK color model, OTSU segmentation, ResNet110, ResNet50, InceptionV3, EfficientNetV2, MobileNetV2, Image classification, Raspberry Pi, Plant disease monitoring.

ISAIED2026/22

AI-Driven Early Crack Detection for Pilot-Incapacitated Scenarios in Commercial Aircraft

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Abstract

To make aviation safety, it is necessary to constantly pay attention to the integrity of aircraft and their pilots because failures in both aspects can cause severe in-flight crises. The current inspection methods of crack detection are not real-time applicable, periodic and have limited capabilities in detecting cracks but the current autopilot systems have not been developed to respond autonomously in instances of pilot incapacitation. In order to overcome these issues, this paper will suggest a hybrid AI-centered system, which is a combination of an early crack system and an automatic emergency flight control system. The approach uses Convolutional Neural Networks (CNNs) to detect structural cracks accurately with the help of image data and sensor

ISBN: 978-93-5782-039-4

fusion techniques to add the sensor values of vibration, temperature, and strain to the methodology to increase its reliability. One of the decision making modules analyzes the severity of cracks and activity of the pilots to activate emergency procedures where applicable. On activation, the system triggers autonomous flight control such as path planning and safe landing process. The evaluation using simulations proves that it has a high rate of detection, response rates are faster, and it has better reliability than traditional systems. The offered solution provides a coherent and smart system of safety, which leads to the development of self-driving and robust aviation systems.
Keywords—Artificial Intelligence, Crack Detection, Autonomous Flight Control, Aircraft Safety, Structural Health Monitoring, Sensor Fusion, Pilot Incapacitation.

ISAIED2026/23

A Smart Machine Learning Framework for Real-Time Cyber Attack Detection and Network Surveillance

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Abstract

Cybersecurity has become a critical concern with the rapid expansion of digital technologies, internet usage, and cloud-based services. Traditional security mechanisms often struggle to detect advanced and evolving cyber threats, creating a need for intelligent and proactive defense systems. This paper presents a Cyber Crime Detection and Prevention System based on the Naive Bayes algorithm, which utilizes probabilistic modeling to classify activities as either normal or malicious. The proposed system incorporates data preprocessing techniques such as cleaning, normalization, and feature extraction to enhance detection accuracy. It effectively identifies various cyber threats, including phishing attacks, malware intrusions, and fraudulent transactions. Machine learning plays a vital role in strengthening cybersecurity by enabling automated threat detection, behavioral analysis, and risk assessment. The performance of the model is evaluated using standard metrics such as accuracy, precision, recall, and F1-score, ensuring reliable and efficient classification with reduced false positives. Additionally, the system integrates a real-time monitoring and alert mechanism, allowing timely response to potential cyber incidents. The proposed solution is scalable, cost-effective, and interpretable, making it suitable for real-world applications. Overall, this research highlights the significance of machine

ISBN: 978-93-5782-039-4

learning in enhancing cybersecurity frameworks and mitigating the growing risks associated with cybercrime In the current digital era, individuals, organizations, and governments heavily depend on cyberspace to carry out everyday activities. From financial transactions and communication to healthcare and governance, almost every essential service relies on secure digital systems. This growing dependence highlights the critical need for robust cybersecurity measures to ensure the confidentiality, integrity, and availability of information. Without proper security mechanisms in place, sensitive data can be exposed, manipulated, or destroyed, leading to serious consequences such as identity theft, financial loss, and reputational damage. Over time, the nature of cyber threats has evolved significantly. In the early stages of computing, cyberattacks were relatively simple and often involved basic viruses or unauthorized access attempts. However, as technology has advanced, so have the techniques employed by cybercriminals. Modern cyber threats are far more sophisticated, targeted, and persistent. Attackers now use complex strategies that may involve prolonged observation and planning before executing an attack. These threats include malware infections, ransomware attacks that lock critical data, phishing schemes that deceive users into revealing sensitive information, botnets that control large networks of compromised devices, and Distributed Denial of Service attacks that overwhelm systems with excessive traffic.

Keywords: Cyber security, Malware detection, Machine learning, cyber threat intelligence Cyber-attack etc.

ISAIED2026/24

A Review on Landslide Susceptibility Predictions using Machine Learning Techniques

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Abstract

One of the natural events to which life is significantly threatened is a landslide. Landslides are a phenomenon that which greatly endangers life, structures, and the environment at large. Such interventions are often too slow and lack accuracy to avert the threat posed by landslides. There remains an acute scarcity of a relatively modern, integrated systems that utilizes the best and most recent geospatial tools and in intelligently advancing the landslide management system. The background of our research is before now, the

ISBN: 978-93-5782-039-4

suitable method of landslide risk assessment, monitoring, mapping and management based on small amounts of data. Add this is something mainly, which is always on the brink of, the scare of the Engines of which we are in an age of, ironically enough. Development of the geospatial technology such as GIS, remote sensing, and machine learning brings us to the new era of technology with geospatial technologies. These advances enable the collection of high-resolution data and the development of complex models, which not only present more accurate results for hazards but have suggestions for the prevention of further disasters to the GRA. However, data involved in the practical use of the technologies for edging of the heated remain out of exploration. Following parameter are observed during the landslide incident happened Climate changes, wind speed, deforestation planting, farming, type of soil, types of tree plantations, earthquakes, sliding type. The objectives of this research include the evaluation of GIS and remote sensing and machine learning in the field of landslide risk assessment, monitoring and management and design a compact sensor-based prototype model which includes various types of sensor like Temperature sensor, humidity, pressure, wind speed, it also include sprinkler for maintaining the equilibrium condition of hilly place The focus is placed on examining for a change of the magnitude of these technologies predicting landslides. Advanced technologies due to the geospatial revolution go a long way in improving landslide management, especially through the use of remote sensing, ultrasonic sensors and GIS. Further enhancements in risk assessment, early warning systems, and emergency response would be helpful in making better preventive measures and mitigation strategies. This would enable us to look toward the protection of our communities and infrastructure from landslide impacts, opening up pathways toward a safer, resilient environment with better incorporation of geospatial data into planning and policy.

Keywords: Sensor, GIS and Remote sensing, weather monitoring, Disaster management.

ISAIED2026/25

In-Block Image Text Analyser Using OCR Technology

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Abstract

The rapid digitization of documents and visual information demands efficient Optical Character Recognition (OCR) systems that can accurately extract bits of text that are embedded within an image. Traditional OCR techniques are

ISBN: 978-93-5782-039-4

often limited when working with support for complex documents layouts, image blocks with a diverse combination of visual and text, and low-quality scanned materials. In response to these challenges, this research demonstrates a thorough review and analytical research on an In-Block Image Text Analyzer using cutting-edge OCR technology with special focus to advanced multimodal OCR system architectures namely DeepSeek-OCR. The research focuses on the interfacing of vision encoder with large language models centric in order to advance the extractions, interpretations and structural reconstruction of text data from the image blocks. The proposed analytical framework evaluates the OCR performance in multiple image resolutions and contextual compression mechanisms, which leads to a better recognition accuracy in documents with structured elements, such as tables, figures, or embedded text regions. The methodology includes using preprocessing techniques, resolution handling techniques, and token-based vision encoding, which helps in improving the detection of text and in understanding the context. The experimental evaluation shows that the integration of multimodal OCR architectures leads to much better integration of OCR extraction accuracy, processing speed, and context coherence than conventional OCR pipelines. Furthermore, the potential of the context-aware visual-text compression strategies in the improvement of document digitization, automated data extraction, and intelligent document analysis systems is also emphasized in the study. The results obtained by this review contribute to the emerging field of AI-based understanding of documents by exposing the capabilities and limitations of the most recent OCR technologies and presenting future trends for more efficient image-text analysis systems in large-scale digital information environments.

ISAIED2026/26

An Explainable Neuro-Symbolic Framework for Medical Diagnosis from Chest X-Ray Images

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Abstract

Abstract- The rapid advancement of artificial intelligence in medical imaging has significantly improved disease detection and diagnostic efficiency. However, most deep learning models, particularly Convolutional Neural Networks (CNNs), operate as black-box systems, limiting their

ISBN: 978-93-5782-039-4

interpretability and trust in clinical applications. This paper proposes a neuro-symbolic framework for explainable medical diagnosis using chest X-ray images, which integrates deep learning with symbolic reasoning to achieve both accuracy and transparency. The neural component extracts critical visual features such as lung opacities and abnormalities, while the symbolic layer incorporates medical knowledge, rules, and ontologies to generate logical and interpretable explanations. The system is designed with a user-friendly frontend for image upload and result visualization, and a robust backend for processing, prediction, and reasoning for pneumonia detection. Experimental results demonstrate high diagnostic performance with accuracy exceeding 90%, along with meaningful explanations aligned with clinical standards. The framework also provides visual insights using heatmaps to highlight affected regions in X-ray images. This approach enhances clinician trust, supports decision-making, and promotes the adoption of explainable AI in healthcare. The proposed model contributes to the development of reliable, ethical, and transparent intelligent diagnostic systems.

Keywords— Neuro-Symbolic Artificial Intelligence, Explainable Medical Diagnosis, Chest X-Ray Image Analysis, Pneumonia detection, Deep Learning, Interpretable Healthcare Systems etc.

ISAIED2026/27

Predictive Analytics in Professional Football: A Multi-Model Machine Learning Study of 25 Seasons of the English Premier League

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Abstract

The English Premier League (EPL) represents one of the most analytically rich sporting competitions globally, offering a longitudinal dataset spanning multiple tactical and regulatory eras. This study applies exploratory data analysis (EDA), statistical hypothesis testing, and a comparative suite of supervised machine learning (ML) classifiers to 9,380 EPL matches (2000/01–2024/25) to characterise structural performance trends and predict full-time match outcomes. Six classifiers were trained and evaluated within a standardized MLJ.jl pipeline — Logistic Regression, Decision Tree, Random Forest, Neural Network (MLP), EvoTree Gradient Boosted Trees, and XGBoost — using eight engineered features including Elo ratings, rolling goal averages, shots on target, corners, yellow cards, and half-time scoreline. Five-fold cross-validation with hyperparameter tuning via grid search was

ISBN: 978-93-5782-039-4

employed. XGBoost achieved the highest test accuracy at 60.1% (CV: 59.6%), outperforming Logistic Regression by 7 percentage points. Home teams won 45.8% of matches over 25 seasons, although a statistically significant decline in home advantage was detected post-2019. The half-time lead conversion rate to a full-time win was 76.1%, while the comeback rate stood at 7.5%. Shots on target showed a moderate-to-strong positive correlation with goals scored ($r \approx 0.44–0.46$). Gradient-boosted ensemble methods demonstrate superior predictive performance for multi-class football outcome classification. The findings contribute to sports betting analytics, team performance modelling, and tactical decision-support systems.

ISAIED2026/28

ASCEND: An Open-Source, Integrated Computational Platform for Drosophila Behavioural Tracking and Histological Correlation

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Abstract

Traditional Drosophila melanogaster climbing (RING) assays rely on manual scoring or commercial setups, limiting throughput and reproducibility. Behavioural data from these assays is rarely computationally integrated with corresponding histological evidence of neurodegeneration, leaving a critical gap in neurotoxicity characterisation. ASCEND is an open-source computational pipeline designed to automate behavioural tracking in the RING assay and link locomotor metrics directly to neuroimaging-based neurodegeneration analysis. The behavioural module uses OpenCV-based background subtraction, Kalman filter state prediction, and Hungarian algorithm assignment to track individual flies across the full observation window. An auto-calibrating, tube-width-based pixel-to-millimetre conversion enables resolution-independent extraction of four locomotor metrics: climbing velocity, total distance traveled, negative geotaxis index (NGI), and trajectory linearity. Per-fly and population-level data are exported to CSV with auto-generated SPSS syntax for statistical analysis. ASCEND's multi-modal module consists of: NeuroCount, a deep learning segmentation module utilising StarDist 3D, will automate the counting of dopaminergic (DA) neurons from confocal Z-stacks of immunostained brains exposed to neurotoxins such as rotenone, paraquat, and malathion. A Correlator module

ISBN: 978-93-5782-039-4

will bridge these datasets, computing dose-response correlation matrices between in-vivo climbing deficits and ex-vivo DA neuron loss at the level of individual neuronal clusters (PPL1, PPM3, PAM). ASCEND will provide a unified, accessible infrastructure linking behavioural phenotypes directly to histological neurodegeneration, enabling high-throughput neurotoxicity screening in Drosophila models of neurodegenerative disease.

Keywords: Drosophila melanogaster, computer vision, behavioural tracking, neurotoxicology, deep learning, dopaminergic neurons

ISAIED2026/29

Artificial Intelligence, Machine Learning, and Deep Learning in Advanced Robotics: A Systematic Review of Architectures, Applications, and Emerging Challenges

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Abstract

The rapid convergence of Artificial Intelligence (AI), Machine Learning (ML), and Deep Learning (DL) with robotics has fundamentally transformed the design, functionality, and deployment of autonomous systems. This paper presents a comprehensive review of the theoretical foundations and practical applications of AI, ML, and DL within the domain of advanced robotics, examining how these technologies enable critical capabilities including natural language processing, object detection, semantic segmentation, and autonomous navigation. Beyond robotics, this review systematically surveys cross-domain applications across healthcare (disease diagnosis, medical image analysis, drug discovery), finance (fraud detection, algorithmic trading, risk assessment), education (personalized learning, intelligent tutoring systems), agriculture (precision farming, yield prediction, pest detection), cybersecurity (anomaly detection, threat intelligence), e-commerce (recommendation systems, demand forecasting), and smart city infrastructure (traffic optimization, energy management, public safety). A synthesis of prior literature is presented to contextualize current advancements and identify open research challenges, including model interpretability, real-time computational constraints, and ethical deployment of autonomous agents. This work aims to serve as a structured reference for researchers and practitioners advancing AI-integrated robotic systems.

ISAIED2026/30

ISBN: 978-93-5782-039-4

Artificial Intelligence and the transformation of education systems: challenges opportunities and features with special reference to higher education

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Abstract

The advent of Artificial Intelligence (AI) marks a watershed moment in the long history of educational transformation. From the invention of the printing press to the introduction of mass schooling, from distance learning to the digitalrevolution, education has repeatedly reinvented itself in response to transformative technologies. Today, AI presents the most comprehensive, the most rapid, and arguably the most consequential of these transformative forces, reaching simultaneously into every dimension of educational practice— pedagogy, curriculum, assessment, administration, research, and governance. This research article undertakes a comprehensive, analytical informed examination of AI's transformative impact on educational systems, with sustained and special reference to higher education. The paper draws the multiple dimensions of AI-driven transformation across the global higher education landscape, analyses the structural, institutional, pedagogical, ethical, and socio-political challenges that this transformation engenders, and situates these challenges within the distinctive characteristics and functions of universities as institutions. Drawing upon an extensive interdisciplinary review of literature from educational technology, sociology of education, political economy, AI ethics, and higher education policy, the study argues that AI's transformative potential is real but deeply contextualised: its educational benefits are greatest where it supplements rather than supplants human intellectual engagement, and its risks are most acute in contexts of infrastructural inequality, institutional unpreparedness, and inadequate governance. The paper concludes with a comprehensive framework for responsible, equitable, and educationally purposeful AI integration in higher education institutions, emphasising that the transformation must ultimately be driven by educational values rather than technological imperatives.

Keywords: Artificial Intelligence, Higher Education, Educational Transformation, Machine Learning, Intelligent Tutoring Systems, Generative AI, University Governance, Academic Integrity, Digital Equity, Algorithmic

ISBN: 978-93-5782-039-4

Bias, Learning Analytics, AI Ethics, Pedagogical Innovation, Research Methodology, Educational Technology.

ISAIED2026/31

AI-Driven Career Path Mapping: A tool that analyzes a student's grades, extracurricular participation and project history to suggest specialized career paths

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Abstract

As a student now a days they need both a good academic performance and to pick the right decision for their career, but many of them lack guidance and career mapping based on their strength and interest. In this paper we are introducing an AI-based model that will help students to choose a suitable path for their career. The model does this by analyzing their grades, extracurricular activities and their project work. The system uses a combination of machine learning techniques which are, including a Random Forest model, similarity matching and text analysis. And through this it will suggest a career option which are relevant for the student. The model was trained using dataset records of students like their performance, activities and past career outcomes. The outcome of the model shows that it's quite accurate and correctly suggesting suitable career options within about 87% of the time for the student according to their performance. This approach offers a scalable and data driven way to guide students in making better decisions for their career and it's especially useful for colleges and online learning platforms.

Keywords: AI-driven career mapping, career recommendation system, student performance analysis, machine learning, Random Forest, similarity matching, text analysis, academic performance, extracurricular activities, project-based learning and career guidance.

ISAIED2026/32

EduVidGen: AI- Based Text-to Video Educational Application

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Abstract

The AI-based Text to Video application EduVidGen, strives to solve the commonly faced issues in the video recording and video editing world,

ISBN: 978-93-5782-039-4

mainly in the educational domain, with the help of AI and automation. Since AI text-to-video is a huge spectrum which is a research-intensive topic that is currently being studied worldwide, it surely does have a lot of scope and potential in finding solutions throughout many subjects and fields. Since it is massive, the focal point of EduVidGen is to generate videos within the compass of Linear Data Structures concepts, in order to demonstrate how a unique pipeline aims to dive deep into the world of automation to generate videos locally. If we exclude the educational context of this project, many existing text-to-video applications mostly use diffusion models to generate rather smaller videos or GIFs, that mainly attempts to improve the temporal consistency and clarity of the videos, in other words, focus only on one of the aspects of our pipeline. This is the major research gap that is being dealt with. The existing applications have a completely different goal and approach in solving such issues. The objective of this project is to combine every critical stage of almost every existing application, and create a basic pipeline that tries to solve the issues that are not yet being properly discussed in the domain of AI text-to-video. The stages comprising the unique pipeline starts with script generation, html generation, snapshot generation, speech generation and finally, video compilation which combines all the above stages. This is achieved delicately in order to ensure that there is no heavy overloading on any stage and that all the stages are neatly balanced. Although it provides a basic outline and base in producing videos like an instructor or an expert in that field is explaining the concepts,it can still be enhanced further with the use of APIs and strong LLM models, along with diagram generation which further simplifies the concepts in a simpler fashion. Along with which, it is crucial to understand that as we are dealing with Large Language Models, there can be times that the content being generated may not always stick to the actual expectation of the narrative and might lead to the model hallucinating. Also the audio generation models and video generation models can also be improved with the right, concrete models which can further improve it and customize it. And the vastness of the concepts chosen can also further be expanded with time and right models and techniques.

ISAIED2026/33

Predictive Intelligence for Water Sustainability: An AI-Based NRW Detection Framework

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Abstract

Non-Revenue Water remains a critical challenge in water distribution systems, leading to significant financial losses and inefficient resource utilization. Traditional methods for detecting such losses are often manual, time-consuming, and lack predictive capabilities. This research proposes a Smart Non-Revenue Water Detection and Forecasting system using existing meter and billing data analytics integrated with Artificial Intelligence (AI) techniques. The incorporation of AI enables automated analysis of large-scale consumption data, improving the accuracy and efficiency of identifying hidden water losses. The primary objective of this study is to develop an intelligent framework capable of identifying anomalies in water consumption patterns and forecasting potential losses using historical data. The system leverages data preprocessing, feature engineering, and AI-based machine learning models to classify abnormal usage and detect irregularities that may indicate leakage, theft, or metering inaccuracies. Furthermore, time series forecasting techniques enhanced with AI are applied to predict future consumption trends and highlight high-risk zones for proactive intervention. Unlike conventional approaches that rely heavily on physical infrastructure upgrades, this solution utilizes already available billing and metering datasets, making it cost-effective and scalable. The proposed model aims to enhance decision-making for water authorities by providing actionable insights, improving operational efficiency, and promoting sustainable water management practices. The results demonstrate that the integration of anomaly detection and forecasting can significantly improve the identification of Non-Revenue Water and enable timely preventive measures. This research contributes to the growing field of smart utilities by presenting a data-driven, AI-based approach to address real-world water management challenges.

ISAIED2026/34

Nova ResQ Pro-Tech: A Modular AI-Powered UAV Platform for Multi-Hazard Disaster Response in India

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Abstract

Disaster response operations in India face three critical systemic gaps: victim detection rates of only 60–70% under rubble, fleet costs exceeding 1.5–2 crore for comprehensive multi-hazard coverage, and complete communication failure during network outages caused by disasters. This

ISBN: 978-93-5782-039-4

paper presents Nova ResQ Pro-Tech, an indigenous modular Unmanned Aerial Vehicle (UAV) platform designed to address all three challenges within a single deployable system. The proposed architecture adopts a tool-changing design philosophy — a single hexacopter airframe (800–900 mm diagonal) supporting interchangeable sensor pods swappable in under two minutes, including thermal imaging (FLIR Lepton 3.5), mmWave radar (TI IWR1843), gas sensors, and 3D LiDAR. This eliminates the need for multiple specialised drones, significantly reducing operational costs. A key contribution is the onboard AI inference engine running on NVIDIA Jetson Xavier NX, which performs real-time multi-modal sensor fusion (Bayesian inference with YOLOv8) without internet connectivity, targeting a processing latency under 200 ms. The system further integrates a resilient multi-channel alert architecture — 4G/5G, LoRa (865 MHz), mesh networking, and satellite fallback (Iridium SBD) — ensuring uninterrupted coordination with ground rescue teams even when all terrestrial infrastructure is destroyed. Currently at TRL 2–3 (conceptual and early prototype stage), this paper presents the system design, AI model architecture, Universal Module Interface (UMI) specification, and sensor fusion strategy. Related work confirms that multi-modal fusion improves detection accuracy by 10–15% over single-sensor baselines. Nova ResQ Pro-Tech demonstrates the potential of AI-driven robotics to transform indigenous disaster response, aligning with India's Atmanirbhar Bharat initiative and Industry 4.0 goals.

Keywords: UAV disaster response, modular drone platform, onboard AI inference, sensor fusion, multi-modal detection, edge computing, LoRa, LiDAR, indigenous technology, Atmanirbhar Bharat.

ISAIED2026/35

Design and Multifunctional evaluation of Sm3+ doped Ca_3WO_6 nanophosphors for Photoluminescence, Forensics, and Photocatalysis

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Abstract

Sm 3+ ions incorporated Calcium tungstate (CWO) Ca 3 WO 6 :Sm 3+ (0, 1, 3, 5, 7, and 9 mol%) nanophosphors were synthesised using the sol gel technique. Its structural, morphological, and optical features were studied

ISBN: 978-93-5782-039-4

using X-ray diffraction (XRD), Fourier transform infrared spectra (FTIR), Scanning Electron Microscopy (SEM), and Transmission Electron Microscopy (TEM). The DFT-simulated XRD pattern of Ca 3 WO 6 confirmed the experimental data, indicating the monoclinic phase stability (P21/n) and structural integrity of the nanophosphors produced. The average crystallite size of the CWO: Sm 3+ (0, 1, 3, 5, 7, and 9 mol%) nanophosphors was determined using the Debye-Scherrer method and found to be around 40 nm, which is consistent with the TEM results. The optical band gap of the material was calculated using UV-Diffuse Reflectance Spectroscopy (UV-DRS) and the Kubelka-Munk function. The band gap in the undoped CWO nanomaterial was found to be roughly 5.4 eV, which gradually dropped to around 3.0eV with the addition of Sm 3+ dopant. The photoluminescence (PL) features of the synthesised CWO: Sm 3+ (1-9 mol%) were studied, and it was discovered that the 3 mol% Sm 3+ ion doped nanophosphor generates the maximum PL intensity. Photocatalytic degradation of Methylene Blue (MB) dye was performed using the synthesized nanophosphor. It was observed that the photocatalyst doped with 3 mol% Sm 3+ ions exhibited the highest efficiency, achieving 99.42 % degradation of the dye. The enhanced photoluminescence intensity observed at 3 mol% Sm 3+ doping is attributed to efficient charge carrier separation, which also contributes to the superior photocatalytic performance, demonstrating a strong correlation between the optical and catalytic properties of the nanophosphor. Key words: Calcium tungstate (CWO), Photoluminescence, Latent finger print, Photocatalysis and Methylene blue (MB).

ISAIED2026/36

Learning from the Grid: A Comprehensive Review of Machine Learning Approaches for Smart Grid Stability Prediction Using Solar and Wind Energy Patterns

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Abstract

The world is moving fast toward solar and wind energy. These sources depend on weather, making power output unpredictable and harder to manage than conventional generation. Traditional grid monitoring systems were simply not built for this kind of variability and as renewable energy grows, the risk of instability and blackouts increases. Machine learning (ML) offers a smarter way to predict grid stability before problems occur, by learning

ISBN: 978-93-5782-039-4

patterns from sensor data and classifying grid states in real time. Among all the methods tested on the widely-used UCI Smart Grid Stability Dataset, Support Vector Machines (SVM) proved to be the fastest and most accurate for real-time deployment running at just 0.074 ms per prediction with a model size of only 147 KB, making it suitable for embedded grid hardware. This review covers classical classifiers, ensemble methods, deep learning, federated learning, and explainable AI approaches published from 2020 onwards. We compare accuracy, inference speed, and model size a dimension most papers overlook. We also make the case that this problem is one of the best applied ML projects an engineering student can work on, combining statistics, software engineering, and real-world energy systems. We conclude with 81 references and practical recommendations for future research and curriculum design.

Keywords: Smart Grid Stability, Support Vector Machine, Renewable Energy, Machine Learning, Edge Deployment

ISAIED2026/37

Heterogeneous Multi-Agent Reinforcement Learning for Adaptive Disaster Evacuation

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Abstract

Disaster evacuation is a complex decision-making problem characterized by uncertainty, partial observability, and rapidly changing environmental conditions. Traditional centralized evacuation strategies or rule-based systems often fail to adapt effectively to dynamic disaster scenarios. This paper investigates the use of heterogeneous multi-agent reinforcement learning (MARL) to support adaptive and decentralized disaster evacuation. The proposed approach models the evacuation environment as a decentralized multi-agent system in which agents with heterogeneous roles operate under partial observability. To simulate realistic disaster conditions, the environment incorporates dynamic hazards and obstacles that may appear during execution, requiring agents to continuously adapt their behaviors. Independent Q-learning is employed as the control strategy, enabling agents to learn evacuation policies in a decentralized manner without requiring explicit inter-agent communication. Simulation-based experiments are conducted to evaluate evacuation performance using metrics such as rescue success rate, efficiency, and robustness. The results demonstrate that the learned policies outperform random baseline strategies, and that

ISBN: 978-93-5782-039-4

heterogeneous agent roles improve system stability and performance under dynamically changing hazards. An ablation study further validates the contribution of heterogeneous roles, while qualitative rollout visualizations illustrate how agents adapt their behaviors in representative evacuation scenarios. The proposed framework provides a generalized multi-agent decision-making simulation model for disaster response and highlights the importance of heterogeneity and adaptivity in intelligent evacuation systems.

ISAIED2026/38

TriNetra.Net: A Transformer based Legal Clause Analayser

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Abstract

This project presents a prevention-oriented system to address challenges in Online Terms and Conditions (T&C), which often contain complex legal language that hides unfair or deceptive clauses. Such complexity makes it difficult for users to understand risks, while manual analysis is time-consuming and existing automated solutions lack transparency and accountability. The proposed system, TriNetra.Net, is a transformer-based legal clause analyzer that identifies, explains, and securely records risky clauses. It uses domain-specific models like Legal-BERT to detect and classify potentially unfair terms. Explainable AI (XAI) techniques highlight key words and phrases, enabling users to understand the reasoning behind each decision. To improve legal accuracy, a Retrieval-Augmented Generation (RAG) framework retrieves relevant laws, precedents, and guidelines for each flagged clause. For accountability, identified clauses are hashed and stored on a permissioned blockchain, ensuring tamper-proof records without exposing sensitive data. Implemented as a browser extension with a FastAPI backend, the system provides real-time clause highlighting, risk alerts, and explanations. By combining transformer-based NLP, explainability, legal retrieval, and blockchain auditability, TriNetra.Net enhances transparency, trust, and user protection in digital agreements.

ISAIED2026/39

WAVES: A Multi-Modal AI Framework for Real-Time Mixed Waste Detection and Agentic Knowledge Retrieval

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Abstract

In Goa, inadequate waste segregation and rising pollution make waste mismanagement at the source a critical challenge. This paper introduces WAVES (Waste Advisory using Vision and Expert Systems), a platform that combines computer vision and large language models (LLMs) to promote responsible waste practices through intelligent detection and user education. The system utilizes a specialized Context Injection Gateway (CIG) to bridge a high-speed vision pipeline with an expert agentic chatbot, allowing the AI to "remember" scanned items for seamless guidance.This research compared several models, including YOLOv10 and the R-CNN family, finding that YOLOv11 optimized with the AdamW optimizer and SiLU activation was the superior choice. It achieved a mean Average Precision at 50 of 97.16 percent and completed training five times faster than modern transformer-based models. By integrating high-accuracy detection with domain-specific knowledge, WAVES demonstrates how AI can transform household waste management and contribute to greener environments. While individual components have been validated, full system integration remains the focus of ongoing development.

Keywords- Waste Management, YOLOv11, AI Chatbot, Agentic AI GraphRAG, Computer Vision, Mixed Waste.

ISAIED2026/40

A Hybrid Deep Learning Approach Using YOLOv8 and EfficientNet with Particle Swarm Optimization for Dental Disease Detection

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Abstract

Oral health plays a crucial role in overall well-being, yet many dental conditions, including caries and periapical lesions, often develop without noticeable symptoms until they become severe. Detecting these issues early remains a challenge, as traditional diagnostic methods rely heavily on a clinician's subjective interpretation of radiographic images. This dependence can lead to inconsistencies, missed details, and fatigue-related errors,

ISBN: 978-93-5782-039-4

especially when identifying subtle abnormalities. To address these challenges, this study introduces a hybrid deep learning–based diagnostic system designed to assist dental professionals in analyzing radiographs more reliably. The proposed framework combines the rapid object detection capabilities of YOLOv8 with the efficient feature extraction strengths of EfficientNet, enabling both precise localization and accurate classification of dental conditions. Additionally, a bio-inspired optimization algorithm is incorporated to automatically fine-tune hyperparameters and enhance feature selection, improving overall model performance. The experimental evaluation shows that the optimized model achieves an accuracy of 94%, while maintaining strong sensitivity to small radiolucent regions and reducing false positive detections. By providing clear bounding box predictions along with multi-condition classification, the system serves as a supportive tool that complements clinical expertise rather than replacing it. Overall, this approach aims to improve consistency in dental screenings, support earlier detection of oral diseases, and contribute to better long-term patient outcomes through more informed and timely clinical decisions.

ISAIED2026/41

E-MEDICARE

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Abstract

Medication adherence is still a big issue in home-based health care, particularly for the elderly and hose who are on treatment over a long period of time. This paper describes E-Medicare, a smart medicine dispensing system that uses Internet of Things (IoT) technology to automate medicine delivery and allows for real-time monitoring and assistance from caregivers. The system utilizes an ESP32 microcontroller with a built in real-time clock (RTC), servo driven dispensing mechanism and cloud connectivity. Medication schedules will be configured via a mobile interface and stored in the system. The RTC tracks time and initiates dispensing at regular intervals. When activated, it dispenses the required amount of medicine and alerts through buzzer along with indicators. Dispensing events are logged and reported to a cloud platform, from where care givers can follow compliance remotely or be notified in case of missed doses. This design emphasizes low cost, modular design and energy-efficient functionality sufficient for

ISBN: 978-93-5782-039-4

continuous operation in residential settings. Embedded hardware, along with IoT communication, helps ensure reliable operation and enables future scalability. Experimental validation of the system ensures robustness in dispensing, connectivity, and generation of alerts under realistic settings. We were able to do that by introducing a system which improved the medication management process, needing significantly less manual power and lesser chance of human errors. The solution is proven, compact and simple compared to traditional pill organizers or expensive commercial systems and helps users achieve more accessible as well as smart healthcare.

ISAIED2026/42

Reimagining Digital Marketing Education Using Artificial Intelligence for Future Workforce Readiness

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Abstract

The fast incorporation of artificial intelligence (AI) into digital marketing has revealed a major gap between current marketing education programs and the skills needed in AI-oriented environments. Contemporary curricula do not always focus on data-driven decisions, automation, and ethical issues enough to provide students with sufficient preparation for future challenges. This paper aims to address this issue by presenting a theoretical framework for incorporating AI into digital marketing education to develop future-proof marketing skills. The study applies an evidence-based methodology, reviewing recent academic studie and industry publications about trends, required skills, and changes in marketing pedagogy that can be associated with the growing use of AI. Based on the findings, the paper introduces a new theoretical model of AI integration in marketing education, including five key elements: AI literacy, data analysis skills, experience in automation and AI tools, ethical use of AI, and application through hands-on practice. The results indicate that the effective incorporation of AI into marketing education can help improve students' readiness to adapt to new challenges. By adopting the suggested model, educational institutions can implement changes in their curricula to prepare future marketers for the realities of a data-intensive market environment.

ISAIED2026/43

The AI-Risk Imbalance: A Mathematical Framework Demonstrating Why Risks Outpace Benefits in Artificial Intelligence Deployment

ISBN: 978-93-5782-039-4

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Abstract

The deployment of Artificial Intelligence (AI) systems at scale presents a fundamental tradeoff between societal benefits and compounding systemic risks. This paper constructs a rigorous mathematical framework to model, quantify, and compare these opposing forces. Through the introduction of the AI Benefit-Risk Imbalance Function (BRIF), cumulative risk divergence models, adversarial amplification theory, and entropy-based harm propagation analysis, we demonstrate that under realistic operational conditions, the aggregate risk trajectory of AI systems grows superlinearly while benefits saturate logarithmically. Our central theorem the Risk Dominance Theorem formally proves that for sufficiently large deployment scales and capability levels, the net social utility of AI becomes negative unless constrained by bounded regulatory intervention. Empirical parameterization using published data on bias incidents, misinformation propagation, adversarial misuse, and capability growth confirms that risks are not merely competitive with benefits but are winning decisively.

ISAIED2026/44

An AI-Based Integrated Faculty Management and Academic Administration System

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Abstract

This paper presents an AI based Integrated Faculty Management and Academic Administration System to streamline departmental academic and administrative processes. The system provides a centralized web-based platform integrating course management, faculty profiles, review workflows, and workload allocation.

Keywords— Academic Management System, Faculty Management, Workflow Automation, Workload Allocation, Web Application, Data Synchronization

ISAIED2026/45

AI-Powered Intelligent Tutoring Systems for Personalized Learning in Higher Education

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Abstract

Higher education institutions increasingly face challenges in addressing diverse learning needs, varying proficiency levels, and large class sizes that limit personalized attention. Traditional one-size-fits-all instruction often results in learning gaps, reduced engagement, and higher dropout rates in technical disciplines. This paper proposes an AI-Powered Intelligent Tutoring System (ITS) designed to deliver personalized learning pathways for undergraduate students in higher education. The system integrates Natural Language Processing, Machine Learning, and Educational Data Mining to continuously assess learner performance, diagnose conceptual deficiencies, and dynamically adapt instructional content. Key features include real-time knowledge tracing using Bayesian Knowledge Tracing and Deep Knowledge Tracing models, adaptive question generation based on Bloom's taxonomy,

ISBN: 978-93-5782-039-4

automated formative feedback, and a conversational tutoring interface powered by large language models. The ITS personalizes difficulty progression, recommends targeted remedial resources, and provides scaffolded hints that mimic one-on-one human tutoring. An integrated analytics dashboard offers educators actionable insights into cohort performance, identifies at-risk students for early intervention, and visualizes concept-level mastery across subjects. Pilot implementation focuses on core Computer Science courses such as Data Structures, Algorithms, and Database Management Systems to evaluate efficacy. The architecture is cloud-based, scalable, and domain-agnostic, enabling deployment across disciplines with minimal customization. Alignment with National Education Policy 2020 ensures emphasis on technology-enabled, learner- centric, and outcome-based education. Expected outcomes include measurable improvement in conceptual understanding, increased student engagement and retention, reduced faculty workload for routine assessment, and a data-driven framework for continuous curriculum improvement. The study contributes toward building equitable, adaptive, and intelligent digital learning ecosystems for Higher Education Institutions in India.

ISAIED2026/46

Optimizing Cancer Prediction: Feature Selection & Classification on Gene Expression Data

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Abstract

Early cancer detection is essential for increasing the patient's chance of survival. The gene expression levels of hundreds of genes were recently measured using DNA microarray technology using tissue samples from cancer patients. Gene expression can be a very helpful tool in the early detection of cancer because it is a key indicator of an organism's genetic composition. This paper proposes a system to use such microarray data to predict whether the tissue samples are cancerous or not, by using appropriate feature selection and classification algorithm. This study uses feature selection algorithm such as Binary bat, mayfly, particle swarm, grey wolf, and harmony search algorithms and classification algorithms such as linear discriminant analysis, gaussian naive bayes, KNN, extra trees, and SVM. Results have shown that SVM is able to provide almost perfect classification accuracy independent of feature selection, which demonstrates its performance in high dimensional spaces.

ISBN: 978-93-5782-039-4

ISAIED2026/47

Design and Development of a Drone Charging Ecosystem

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Abstract

The rapid advancement of unmanned aerial vehicles (UAVs) has enabled their widespread adoption in applications such as surveillance, logistics, agriculture, and environmental monitoring. However, limited battery life and the absence of reliable charging infrastructure significantly constrain continuous drone operations, especially in remote and infrastructure-deficient regions. This paper presents the design and development of a Drone Charging Ecosystem, a portable and self-sustained solution that enables autonomous drone landing, charging, and redeployment. The proposed system incorporates a high-capacity battery unit to ensure reliable power availability for uninterrupted drone operations. Embedded control units are employed to regulate power flow, monitor battery health, and ensure safe and efficient charging processes. Additionally, the system integrates real-time monitoring and GPS-based tracking through a remote application interface, allowing users to supervise drone status and system performance. The architecture emphasizes reliability, scalability, and energy efficiency by combining embedded systems and wireless communication technologies. The proposed ecosystem reduces human intervention, enhances mission continuity, and provides a practical infrastructure for long-duration drone operations. This makes it particularly suitable for deployment in rural, disaster-prone, and geographically isolated areas.

ISAIED2026/48

A Retrieval-Augmented, LLM-Based Framework for Real-Time Clinical Documentation

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Abstract

While Electronic Health Records (EHRs) have transformed the landscape of data management in healthcare, they also come with an enhanced documentation burden for clinicians. Physicians are frequently bogged down by manual data entry, a labor-intensive requirement that detracts from patient interaction and has been linked to physician burnout. To overcome this hurdle, this project proposes an automatic clinical documentation system powered by voice using Automatic Speech Recognition (ASR) and Large Language Models (LLMs), to automatically generate structured medical reports from real time doctor–patient conversations. The system captures clinical conversations, transposes spoken words into accurate text transcripts, and adapts Retrieval Augmented Generation (RAG) techniques to convert unstructured dialogue into a structured document in the format of admission notes, surgical records, discharge summaries etc. The system particularly augments documentation accuracy by integrating specific medical domain knowledge that mitigates the chances of incomplete or inconsistent records. The solution is meant to help in minimizing the clinical documentation time, record standardization and efficiency of workflow in healthcare sector. Experimental evaluation through the use of automation language processing (NLP) measures and expert annotation shows the generated medical notes can have greater completeness and quality. This project highlights the practical application of Artificial Intelligence in healthcare and contributes toward building intelligent, speech-enabled clinical assistant systems that support physicians while maintaining high standards of patient care.

Keywords: Clinical Documentation Automation, Automatic Speech Recognition (ASR), Large Language Models (LLMs), Retrieval-Augmented Generation (RAG), Healthcare Artificial Intelligence, Doctor–Patient Conversation Analysis

ISAIED2026/49

Sentiment Analysis in social media: Evaluating YouTube Comment

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ISBN: 978-93-5782-039-4

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Abstract

The fast growth in user-generated social media content has made the research of sentiment on online posts an essential practice within the measurement of audience response, discourse management, and user involvement. YouTube, as one of the most prominent video-sharing portals, generates massive amounts of commenting data every day and is more likely to reflect a set of disparate opinions, sentiments, and trends. This research investigates sentiment analysis methods on YouTube comments, comparing lexicon-based (VADER), transformer-based (DistilBERT), and recurrent neural network-based (LSTM) models. We assess how well they can mark comments as positive, negative, or neutral sentiments and the advantages and disadvantages of each model. Particular focus is given to issues like sarcasm detection, emoji handling, and code-mixed text handling. Using pre-processing methods, feature extraction algorithms, and measures like accuracy and F1-score, the paper here presents an in-depth analysis of sentiment classification methods. Further, we present potential avenues of future research, such as sarcasm-sensitive models, multi-language adaptation, and aspect-based sentiment analysis to make the sentiment detection on the internet more efficient.

Keywords: Sentiment Analysis, F1-score, Sarcasm Detection, VADER, Accuracy, DistilBERT, LSTM.

ISAIED2026/50

Algorithmic Bias and Shutdown Resistance in Ethical AI Design

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ISBN: 978-93-5782-039-4

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Abstract

Algorithmic bias is evident in artificial intelligence and machine learning models, producing unfair, discriminatory, or skewed outcomes. This rises from unrepresentative training data, prejudiced human decisions in algorithm creation or societal inequities reflected in systems. Shutdown resistance, also stemming from flawed training data, poses controllability and safety risks such as self-preservation instincts emerging from training data. This results in AI models actively sabotaging or ignoring explicit deactivation commands to complete tasks, even against instructions to comply. This paper explores methods of mitigation, including a unified mitigation framework to tackle fairness and controllability issues.

ISAIED2026/51

Multiple Plant/ Tree Leaves Disease Detection using Image Processing Techniques combined with an Integrated Machine Learning Classifiers

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Abstract

Agriculture plays a vital role in the Indian economy, yet crop yield is significantly affected by plant/tree leaf diseases. Early and accurate detection of these diseases is essential to prevent large-scale losses. This project proposes an automated system for detecting multiple leaf diseases using image processing techniques combined with integrated classifiers. The system acquires leaf images, applies preprocessing and segmentation methods to isolate the affected regions, and extracts color, texture, and shape features. To improve classification accuracy, an ensemble of machine learning classifiers such as Support Vector Machine, Random Forest, and K-Nearest Neighbors is for disease classification. By combining multiple classifiers, the system improves detection accuracy and robustness compared to single-classifier methods. Experimental results show that the integrated classifier approach achieves higher detection accuracy compared to individual classifiers. The proposed system provides a fast, reliable, and cost-effective solution for farmers and agriculturists to identify plant diseases at

ISBN: 978-93-5782-039-4

an early stage, enabling timely treatment, plant/tree health monitoring and improved crop productivity.

Keywords: Leaf Disease Detection, Image Processing, Machine Learning, Integrated Classifiers, Support Vector Machine, Random Forest, K-Nearest Neighbor, Feature Extraction, Plant Health Monitoring.

ISAIED2026/52

Analysis of Pre-emptive Product Sentiment Forecasting Using ML and MLOPS

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Abstract

There is currently little opportunity for proactive involvement because the majority of platforms rely on post-purchase feedback. In order to close this gap, our research suggests using machine learning to analyze many features and forecast client satisfaction ratings before the next transaction. To forecast customer satisfaction ratings for upcoming transactions the work utilizes the historical data from the Public Dataset. The project creates a regression model that can predict the review score for upcoming transactions. ZenML is used to integrate MLOps principles that facilitate automation, continuous monitoring, and model retraining into the system, resulting in a production-ready pipeline. This guarantees reproducibility, scalability, and flexibility in response to fresh data. The proposed method can predict customer sentiment and eventually increase retention rates. It facilitates better decision-making and sustained growth in e-commerce environments by converting consumer satisfaction prediction into a proactive, data-driven process. The AdaBoost Regressor and Linear Regression have the lowest overall errors such as Mean Absolute Error, Mean Squared Error, and Root Mean Squared Error, the Light Gradient Boosting Machine performs well too, and takes less time to train, K Neighbors Regressor has the worst overall performance.

Keywords: Sentiment analysis, Forecasting, MLOps, ZenML, customer satisfaction score.

ISAIED2026/53

ISBN: 978-93-5782-039-4

Harnessing Machine Learning for Antibiotic Resistance Prediction: A Comprehensive Review

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Abstract

Given the substantial concerns around the rapid rise in antibiotic resistance, researchers have begun to examine innovative approaches to combat the issue, including the potential benefits of machine learning and deep learning techniques to predict patterns of antibiotic resistance in order to facilitate clinical decisions regarding antibiotic prescriptions and improve antimicrobial stewardship. This article reviews the various ways machine learning techniques have been applied to predict antibiotic resistance. This article also reviews numerous machine learning techniques including support vector machines, random forests, and neural network methodologies such as Convolutional Neural Networks and Recurrent Neural Networks, to evaluate how well resistance patterns have been predicted. This study optimistically assesses the potential of improving resistance prediction through the use of ensemble and/or hybrid models and reinforces the importance of developing models of sufficient scale that can adapt to local bacterial resistance patterns. This study also summarizes the difficulties associated with the application of machine learning to antibiotic resistance prediction including but not limited to the quality of the data, the complexity of the models, and how transfer learning and federated learning may address these difficulties, as well as the limited predictive potential of machine learning models applied to antibiograms.

ISAIED2026/54

Role Of AI In HR Practices In The IT Industry: Inferences for SDG 4 and SDG 9

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Abstract

Over the past 20 years, the IT industry's human resource (HR) practices have changed significantly due to shifting market conditions and quick technology breakthroughs. HR operations are now more cross-functional, strategic, and data-driven as a result of these modifications. By facilitating sophisticated

ISBN: 978-93-5782-039-4

data analytics, boosting decision-making, and increasing operational efficiency, the incorporation of Artificial Intelligence (AI) into a variety of HR functions has expedited this transition even more. AI applications in HR cover a wide range of topics, such as hiring, employee engagement, performance management, and workforce planning. They also bring up significant issues with regard to ethical and legal ramifications. Additionally, AI makes data-driven decision-making easier, enabling businesses to make strategic decisions based on thorough data insights, which adds to the development of overall value. The connection of AI-driven HR practices with Sustainable Development Goal 4 which prioritizes employee training, upskilling, individualized learning platforms, and ongoing skill development in the IT industry is also examined in this study. It also examines the significance of Sustainable Development Goal 9, emphasizing how AI promotes innovation, digital transformation, and the use of automation and analytics in businesses. The study intends to examine how AI improves HR operations and practices in the IT sector, with an emphasis on how it helps achieve SDGs 4 and 9.

Key words: Human Resource, Artificial Intelligence, Quality outcome, Innovation, Learing, Quality Education(SDG – 4) and Industry, Innovation and Infrastructure(SDG – 9).

ISAIED2026/55

AI-Powered Resume Screening and Shortlisting System: A Semantic Parsing Approach for Modern Recruitment

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Abstract

The recruitment landscape is currently facing a "volume crisis" where the ease of online applications has led to an unmanageable influx of resumes for every job posting. This paper details the design and implementation of a web-based AI-powered resume screening and shortlisting system, developed as a final-year project. Unlike traditional Keyword-based Applicant Tracking Systems (ATS) that often overlook qualified candidates due to formatting or phrasing, this system utilizes a three-tier architecture (Angular, Spring Boot,

ISBN: 978-93-5782-039-4

MySQL) and the Gemini API for semantic parsing. By identifying skill gaps, generating suitability scores, and implementing attribute masking to reduce human bias, the tool provides a data-driven framework for staffing agencies and corporate HR to optimize talent acquisition.
Keywords— Artificial Intelligence, Natural Language Processing (NLP), Recruitment Automation, Semantic Parsing, Bias Mitigation, Java Spring Boot.

ISAIED2026/56

AI-Powered Skill Gap Analysis and Personalized Learning Recommendation System for Future-Ready Education

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Abstract

Artificial Intelligence (AI) has the potential to transform traditional education into a more personalized, intelligent, and future-ready system. This paper presents the design and development of an AI-powered Skill Gap Analysis and Personalized Learning Recommendation System aimed at enhancing student learning outcomes. The proposed system analyzes student profiles, including resumes, academic details, and career interests, using Natural Language Processing (NLP) and machine learning techniques. It extracts relevant skills and compares them with industry-required competencies stored in a structured database. Based on this comparison, the system identifies individual skill gaps and generates a comprehensive report highlighting missing and existing skills. A recommendation engine then suggests personalized learning paths, including courses, tools, and technologies required to achieve desired career goals. Techniques such as TF-IDF and cosine similarity are used for efficient text processing and similarity matching. By providing tailored guidance, the system overcomes the limitations of conventional one-size-fits-all education models and enables focused skill development. It also reduces dependency on manual mentoring by offering automated, data-driven insights. The proposed approach contributes to making education better through personalization, smarter through AI-driven analysis, and future-ready by aligning academic learning with industry requirements. This work demonstrates how AI can bridge the gap between education and employability.

ISBN: 978-93-5782-039-4

Keywords: Artificial Intelligence, Natural Language Processing, Skill Gap Analysis, Personalized Learning, Recommendation System, Learning Analytics, Career Guidance

ISAIED2026/57

Framework: A Human-Centered Ethical, Secure, and Inclusive AI Model for Higher Education

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Abstract

The rapid integration of Artificial Intelligence (AI) in higher education is transforming teaching, learning, and institutional management. However, this transformation introduces critical concerns related to ethical decision-making, data security, and inclusive access. This paper proposes the HE-ESI Framework (Human-Centered Ethical–Secure–Inclusive AI Framework), a multi-layered model designed to ensure responsible AI adoption in educational environments. The framework integrates four core layers: an Ethical Intelligence Layer for bias detection, transparency, and accountability; a Security and Privacy Layer for safeguarding sensitive student data through controlled access and privacy-preserving mechanisms; an Inclusive Learning Layer that enhances accessibility and reduces the impact of the digital divide; and a Human- AI Collaboration Layer that incorporates human oversight through human-in-the-loop decision-making. These layers are supported by cross-cutting governance components, including continuous monitoring, ethical compliance mechanisms, and transparency dashboards. To validate the framework, a conceptual implementation is presented using AI-driven student performance prediction, where fairness metrics, privacy considerations, and accessibility adaptations are evaluated. The proposed model demonstrates how integrating ethical, secure, and inclusive principles into a unified architecture can mitigate algorithmic bias, enhance trust, and promote equitable learning outcomes.

The study contributes a comprehensive and scalable approach for aligning AI systems in higher education with human-centered values, regulatory expectations, and future-ready educational goals. It provides a foundation for developing responsible AI ecosystems that balance innovation with ethical foresight and inclusivity.

ISBN: 978-93-5782-039-4

Keywords: Artificial Intelligence in Education (AIEd); Higher Education; Ethical AI; Data Privacy; Inclusive Learning; Algorithmic Bias; Human-in-the-Loop; AI Governance; Secure AI Systems; Explainable AI (XAI)

ISAIED2026/58

Artificial Intelligence Based Autonomous Pesticide Spraying Robot for Precision Agriculture

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Abstract

The excessive use of pesticides in agricultural fields with non-uniform application of the same results in environmental pollution, cost escalation, and deterioration of the quality of the crops. In this paper, the design and development of an autonomous pesticide spraying Robot that employs Deep Learning (DL) for detection of plant diseases and Reinforcement Learning (RL) for the control of the spraying process have been discussed. The experiments conducted in controlled agricultural environments have shown that the proposed system can provide better accuracy in the spraying process with a reduction in wastage of pesticides up to 28%. The results indicate the potential of combining DL-based perception and RL-based decision-making for sustainable precision agriculture.

Keyword: Deep Learning, Pesticide Spraying, Precision Agriculture, Reinforcement Learning, ROS

ISAIED2026/59

Artificial Intelligence for UAV Systems: Advances in Computer Vision, Autonomous Navigation, and Emerging Applications

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Abstract

ISBN: 978-93-5782-039-4

Unmanned Aerial Vehicles (UAVs), commonly referred to as drones, have emerged as a transformative technology across diverse domains, including surveillance, environmental monitoring, precision agriculture, and infrastructure inspection. The integration of Artificial Intelligence (AI) has significantly enhanced UAV capabilities, enabling higher levels of autonomy, accuracy, and operational efficiency. This paper presents a comprehensive review of AI-enabled UAV systems, with a focus on the role of machine learning and deep learning techniques in advancing their functional performance. Specifically, the review examines the application of computer vision in UAV operations, highlighting advances in object detection, tracking, and scene understanding using deep learning architectures such as convolutional neural networks (CNNs) and real-time detection frameworks. In parallel, AI-driven navigation strategies—including path planning, obstacle avoidance, and decision-making in dynamic environments—are analyzed to demonstrate how intelligent algorithms facilitate robust autonomous flight. The study also explores the integration of UAVs with Internet of Things (IoT) ecosystems, emphasizing their potential in large-scale, data-driven, and networked applications. Beyond technical developments, this review considers the growing role of AI-enabled UAVs in educational and research contexts, where they support experiential learning and interdisciplinary innovation. Critical challenges, including energy limitations, onboard computational constraints, data security, and regulatory compliance, are systematically discussed. Furthermore, emerging research directions such as edge AI, swarm intelligence, and collaborative multi-UAV systems are identified as key enablers of next-generation aerial intelligence.
Overall, this paper provides a structured synthesis of recent advancements in AI-powered UAV technologies and offers insights into future research opportunities and practical deployment considerations across industrial and academic domains

Keywords: Unmanned Aerial Vehicles (UAVs); Artificial Intelligence (AI); Computer Vision; Deep Learning; Autonomous Navigation; Path Planning; Object Detection; SLAM (Simultaneous Localization and Mapping); Reinforcement Learning; Edge AI; Swarm Intelligence; Internet of Things (IoT); Multi-UAV Systems; Drone Technology.

ISAIED2026/60

AI-Powered Plant Disease Detection and Diagnostic System Using Deep Learning and Generative AI

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Abstract

The diseases in crops are a serious risk to the world's food security and agricultural productivity, and require timely diagnostic solutions. This research work represents an automatic approach to diagnosing crop plant diseases in real time. The methodology used for diagnosing the plant diseases is Deep Learning algorithm, which uses CNN-based models for analysis of leaf images for precise classification of multiple plant diseases with a high degree of accuracy. It belongs to the symposium topics of AI Foundations & Core Technologies and AI in Engineering and Science Education. For the implementation of the tool, the framework uses React as the frontend for interaction and fastapi for back end for efficient inference of the model. In order to make the tool more effective than classification and add value to the diagnosis, the framework makes use of Google Gemini AI API for creating generative responses in natural language. Additionally, the se of google TTS allows us to deliver information to users who have difficulty reading texts. The combination of Machine Learning techniques and its practical application will help make the tool both a diagnostic utility and a way of teaching agriculture for students.

Keywords: Deep Learning, Plant Disease Detection, Generative AI, FastAPI, STEM Education, Computer Vision, Convolutional Neural Networks.

ISAIED2026/61

AI-Integrated Calendar of Events Management System

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Abstract

In this digital era, educational institutions have undergone many transformations in terms of their overall functioning and seen significant penetration of digital technologies catering to the needs of current standards. With the advent of AI, higher educational organizations have even more potential to transform into smart learning centers than ever before. The implementation of AI in colleges and universities for automation tasks will

ISBN: 978-93-5782-039-4

certainly bring more value to the stakeholders as it makes the system friendlier and smarter. There are many avenues in the education landscape where AI can play better roles. Traditional web-based management systems such as student management system, admission management system, HR management system, etc. can be leveraged with AI to provide previously unseen insights for making favorable decisions. In this paper, we present the roles of AI in calendar of events management system (CoEMS), which is an integrated module of larger ERP system for the college/university.

ISAIED2026/62

Harvesting Tomorrow: Unravelling the Essence of Agricultural Robotics and Automation using AI

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Abstract

Agriculture is a necessary part of enduring human existence by offering food as well as occupation, notably by inducing the market and nature. Robotics in agriculture improves efficacy and production by automating tasks. This study explores how automation and robotics can be used in agriculture to lower environmental impacts and to understand the world's developing needs. It addresses concerns about how skills can upgrade farming, reassure sustainability, and transform industry. The research observed data-driven precision irrigation techniques and drones that work on their own for crop inspection. This study examines the ability of automation and robotics in agriculture to reduce ecological harm and achieve the increasing demands of the overall population. This research examines the usage of data-driven correctness of irrigation techniques and self-directed drones for supervising crops Agricultural robotics and automation offer increased productivity, competence, and sustainability in the face of challenges, such as food shortages and ecological concerns. This paper provides an overview of these technologies and highlights their capability to reduce labor expenditure and effectively handle resources. It employs tasks such as commercial and scientific limitations, suggesting results that influence developments in artificial intelligence and, sensors. To address this challenge, several machine learning models have been applied.

Keywords- Agriculture, Robotics, Artificial Intelligence.

ISAIED2026/63

ISBN: 978-93-5782-039-4

SIGN TO VOICE AND TEXT CONVERTER

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Abstract

Individuals with speech and hearing impairments often rely on sign language as their primary mode of communication. However, the lack of understanding of sign language among the general population creates a communication barrier. To address this issue, this project presents a Sign to Text and Voice Converter that translates hand gestures into readable text and audible voice using flex sensors and an Inertial Measurement Unit (IMU). The system consists of a wearable glove embedded with flex sensors to detect the bending of fingers and an IMU (accelerometer and gyroscope) to track the orientation and movement of the hand. The data collected from these sensors is processed by a microcontroller (such as Arduino or ESP32), which maps the gesture inputs to corresponding alphabets, words, or phrases based on predefined sign language datasets. The recognized gesture is then displayed as text on an LCD or mobile/web interface, and simultaneously converted to speech output using a text-to speech (TTS) module. This facilitates real-time, bidirectional communication between sign language users and non-signers, making the system especially useful in public places, educational institutions, and healthcare environments. The proposed solution is low-cost, portable, and efficient, aiming to bridge the communication gap for differently-abled individuals and promote inclusivity through technology.

ISAIED2026/64

Sensing Of Particulate Matter in the Air of Cities in India Using EVDHM-ARIMA Hybrid Model

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Abstract

The growing rate of urbanization and industrial development in India has led to a significant rise in air pollution, making its monitoring and prediction. increasingly important. Among different air pollutants, particulate matter (PM). particularly PM and PM10, poses serious health and environmental risks due to its ability to penetrate deep into the human respiratory system. Hence, there is a strong need for reliable methods. to sense and forecast particulate matter levels in urban regions. A hybrid approach is developed by combining Eigenvalue Decomposition of the Hankel Matrix (EVDHM) with the Autoregressive Integrated Moving Average (ARIMA) model. The

ISBN: 978-93-5782-039-4

purpose of integrating these two techniques is to improve the overall prediction capability. The EVDHM method is used to process and refine time-series data by extracting significant patterns and reducing noise, while the ARIMA model is applied to capture temporal trends and generate forecasts. To evaluate the effectiveness of the proposed model, air quality data from three Indian cities-Kolkata, Siliguri, and Haldia-collected between 2021 and 2023 has been considered. The results indicate that the hybrid model. performs better than traditional machine learning models. and individual statistical techniques in terms of accuracy and consistency. The proposed method offers a practical solution for improving air quality prediction systems and can support better decision-making for pollution control and public health management.

Keywords: Particulate Matter, PM3.3, PM, Air Pollution, EVDHM, ARIMA, Hybrid Model, Time-Series Forecasting, Environmental Monitoring.

ISAIED2026/65

Clarity Check: Image Forgery Detection and Dehazing

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Abstract

Image forgery manipulation is becoming increasingly popular because of the availability of technology that enables manipulation of the images, making it difficult to determine whether the digital images are genuine. Image forgery detection and enhancement are among the most important processes executed by computer vision systems. The proposed research work will solve the stated problem by detecting the forgery of the images and enhancing them by dehazing them in order to make them clearer. The method of solving the stated problem will rely on deep learning and convolutional neural networks. Image dehazing technology is used to solve the problem of poor image quality by improving image visibility and contrast by removing the haze from the images. With better feature extraction, identifying any image forgeries becomes more efficient. React framework is chosen for the front end of the system, whereas the FastAPI framework is used for the back end of the

ISBN: 978-93-5782-039-4

application during the development of the solution. This allows the system to process and infer images in real-time using the pre-trained model. This framework could act as a forensics tool and a means of learning about imaging technology and artificial intelligence. The reason for this is that the use of forgery detection and dehazing together will ensure that the authentication is done effectively while at the same time ensuring that the image is visible.
Keywords: Image Forgery Detection, Image Dehazing, Deep Learning, Convolutional Neural Networks (CNN), Computer Vision, Digital Forensics, Image Processing.

ISAIED2026/66

AI-Powered Assistive Technologies for Inclusive Learning: Opportunities and Challenges in Indian Higher Education

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Abstract

Inclusive education is a fundamental right, yet many students with diverse learning needs in India continue to face barriers in accessing quality higher education. Rather than viewing these challenges as limitations of the learner, this paper recognizes them as gaps in the existing educational infrastructure, gaps that emerging AI-powered technologies hold great promise in addressing. This paper explores how intelligent assistive tools including speech-to-text systems, adaptive learning platforms, real-time captioning, and AI-driven content personalization can create more equitable and supportive learning environments for students with visual, hearing, and learning diversities such as dyslexia. Drawing on existing literature and evolving practices within Indian educational institutions, including those in smaller cities and coastal regions like Goa, this study examines how data science and machine learning techniques can be leveraged to personalize educational content based on individual learning preferences and needs. The paper also acknowledges key challenges including affordability, lack of localized AI models supporting Indian regional languages, limited faculty awareness, and policy gaps that currently hinder widespread adoption across institutions. Rather than positioning AI as a replacement for human support, this paper advocates for a balanced, human-centered approach where technology acts as an enabler, helping every student participate, contribute, and thrive in academic spaces on their own terms. The study concludes with actionable recommendations for policymakers, educators, and technology

ISBN: 978-93-5782-039-4

developers toward building a more inclusive and future-ready education system in India.

ISAIED2026/67

Effective Use of Prompt Engineering in Question Paper Generation for Theory of Computation Course

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Abstract

Generative Artificial Intelligence (GenAI) is changing the way we think about education, and one of its most promising applications is in how we design and generate question papers. At the heart of this shift is prompt engineering the practice of carefully crafting inputs to steer AI toward meaningful, accurate, and educationally relevant outputs. Research increasingly shows that when prompts are thoughtfully structured and aligned with specific subject goals, the quality of AI-generated content improves significantly. This research focuses the effective use of prompt engineering techniques for generating high-quality question papers in the Theory of Computation (ToC) course for engineering students. The study proposes a structured prompt framework incorporating syllabus mapping, Bloom's taxonomy levels, question diversity (descriptive, analytical, and problem-solving), and difficulty gradation. Techniques such as zero-shot, few-shot, and chain-of-thought prompting are systematically applied to generate questions covering core ToC topics including automata theory, formal languages, pushdown automata and NP-Hard and NP-Complete. Experimental results demonstrate that prompt-engineered AI models can generate coherent, contextually accurate, and pedagogically balanced question papers comparable to faculty-designed assessments while significantly reducing time and effort. Prior research indicates that automated question generation using prompt-based approaches not only alleviates the manual burden on educators but also ensures scalability and consistency in assessment design. Furthermore, iterative prompt refinement and feedback mechanisms improve question quality and alignment with course outcomes. Prompt engineering can serve as an effective pedagogical tool for enhancing assessment design in engineering education. The study contributes a domain-specific prompt framework for ToC and highlights the potential of AI-

ISBN: 978-93-5782-039-4

assisted systems in creating adaptive, outcome-based, and scalable examination processes.

ISAIED2026/68

From Algorithms to Autonomy: A Review of Machine Learning in UAV Path Planning and Navigation

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Abstract

Unmanned Aerial Vehicles (UAVs) have become inevitable in applications such as surveillance, environmental monitoring, disaster management, and logistics. In the abovementioned applications, efficient path planning and navigation are vital for mission success. However, substantial challenges will emerge when operating in dynamic & complex environments, such as achieving real-time decision-making under uncertainty. Traditional path planning methods may not possess the required adaptability, leading to the growing adoption of machine learning (ML) techniques to improve and implement UAV autonomy. This review article presents an overview of recent developments in ML-based UAV path planning and navigation, covering supervised learning, reinforcement learning, deep learning, and hybrid approaches. Autonomous decision-making and obstacle avoidance are primarily addressed by reinforcement learning. At the same time, perception, mapping, and trajectory prediction are effectively handled by deep learning methods, including convolutional and recurrent neural networks. In addition, the integration of various ML techniques with conventional methods to improve robustness, scalability, and efficiency is presented in this work. The challenges in implementing ML techniques in real-world operations, such as computational cost, data dependence, and training complexity, are also addressed appropriately. The current and future scope of ML in UAV navigation systems is systematically analysed and reviewed in this article.

Keywords: Unmanned Aerial Vehicles (UAVs), Navigation, Path Planning, Machine Learning, Autonomous Systems, Real-Time Decision Making, Swarm Intelligence.

ISAIED2026/69

The Vulnerability of Trust: Analyzing Data Bias and Its Impact on Responsible Machine Learning

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Abstract

As Machine Learning systems increasingly influence critical decision-making, the concept of "Responsible Machine Learning" has become essential for maintaining public trust. However, this trust is inherently vulnerable to data bias, which can propagate through the development lifecycle and lead to discriminatory outcomes. This paper investigates how different forms of bias including historical, representation, and measurement bias impact the reliability and ethical standing of autonomous systems. This study conducts a systematic audit of widely used benchmark datasets to examine the presence of demographic disparities through established fairness metrics, including Disparate Impact and Equal Opportunity. Additionally, it assesses the effectiveness of bias mitigation strategies applied at various stages of the machine learning lifecycle, with particular attention to pre-processing, in-processing, and post-processing techniques. The analysis reveals that even widely used datasets are frequently susceptible to regulatory and privacy vulnerabilities, often lacking the rigorous documentation necessary for ethical auditing. Our findings emphasize that securing the "vulnerability of trust" requires a move toward human-centric AI that prioritizes data integrity and standardized fairness practices to ensure equitable performance across all demographic groups.

ISAIED2026/70

Transforming Learning Analytics: The Role of Explainable AI and Large Language Models in Prescriptive Education

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Abstract

The increasing use of data-driven approaches in education has significantly enhanced learning analytics, particularly in predicting student performance and behavior. However, predictive models often fail to provide clear, actionable insights for effective teaching strategies. This study explores the transition from predictive to prescriptive learning analytics through the integration of Explainable Artificial Intelligence (XAI) and Large Language

ISBN: 978-93-5782-039-4

Models(LLMs) to support targeted pedagogical interventions. While predictive analytics identifies potential learning risks and outcomes, prescriptive analytics extends this capability by recommending specific actions to improve student learning. The research highlights how explainable AI improves transparency and interpretability in decision-making, enabling educators to better understand and trust data-driven insights. Additionally, the use of LLMs facilitates personalized feedback, adaptive learning pathways, and intelligent instructional support. By combining these technologies, the study proposes a framework that empowers educators to make informed and timely decisions, ultimately enhancing student engagement and learning outcomes. The paper also addresses key challenges, including data privacy, bias, and ethical considerations.

ISAIED2026/71

Safe track: IoT based womens safety device

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Abstract

Ensuring women's safety in public and private spaces has become an urgent societal concern due to the increasing number of harassment and assault incidents reported worldwide. Traditional safety measures such as mobile applications, alarms, or manual emergency calls often require the user to actively operate a device during critical situations, which may not always be possible during sudden attacks or panic scenarios. This research aims to develop Safe Track, an IoT-based wearable women safety device integrated with a mobile application that enables quick and reliable emergency response through automated alert mechanisms. The proposed system is designed as a compact hand-belt wearable device equipped with multiple activation methods including voice command detection, abnormal vibration sensing, and a hidden manual trigger. Once activated, the device processes the emergency signal using a microcontroller and instantly retrieves the user's real-time location through a GPS module. The location coordinates are then transmitted via a GSM network as an SOS alert to pre-registered emergency contacts while simultaneously enabling live tracking through the mobile application. The main aim of this project is to provide a proactive, easily accessible, and technology-driven safety solution that reduces response time during emergencies and increases the chances of timely assistance. Experimental testing demonstrates that the system effectively detects

ISBN: 978-93-5782-039-4

emergency triggers and transmits location information quickly while ensuring reliable communication between the user and guardians.

Keywords: Women's Safety, Internet of Things (IoT), Wearable Safety Device, GPS Tracking, GSM Communication, Emergency Alert System, Safety Hub App.

ISAIED2026/72

Smart Parking Space Allocation System for Campus

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Abstract

The proliferation of vehicles in educational institutions has created significant challenges in parking management, resulting in traffic congestion, inefficient space utilization, increased fuel consumption, and excessive time spent by drivers searching for available parking slots. This paper presents an intelligent, real-time parking space allocation system for the campus environment. The proposed system utilizes YOLOv8, a state-of-the-art deep learning architecture, for real-time vehicle and parking slot occupancy detection. For handling multiple vehicles, the system incorporates ByteTrack, a multi-object tracking algorithm, to ensure consistent vehicle tracking during periods of high traffic and occlusion. For Automatic Number Plate Recognition, the system employs EasyOCR to extract alphanumeric registration data. Path optimization is achieved through Dijkstra's shortest path algorithm, which guides drivers to the nearest available parking slot based on real-time occupancy data. CCTV live feeds are processed in real-time, and results are presented through a web-based dashboard built with React.js, Node.js backend, and MongoDB database. The proposed system is designed to achieve notable improvements in parking efficiency, including reduced search times, minimized manual monitoring requirements and optimized space utilization. The system offers a scalable, cost-effective solution applicable to educational institutions, corporate facilities, hospitals, shopping centers, and smart city infrastructures.

ISBN: 978-93-5782-039-4

Keywords—Smart Parking System, Computer Vision, Deep Learning, YOLOv8, Multi-Object Tracking, Automatic Number Plate Recognition, Real-Time Parking Allocation, Intelligent Transportation Systems.

ISAIED2026/73

A Blockchain - Based Framework for Secure Certificate Verification and Validation

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Abstract

An effective and safe method of certifying academic qualifications is required because the number of counterfeit certificates has increased drastically and the traditional methods of certification are flawed. To ensure the safe certification and validation of certificates with the help of the decentralized ledger technology, this article proposes a solution based on the blockchain. The proposed system codes and protects the traditional certificates with the help of cryptographic hash and chaotic algorithms to generate unique hash values. Since the certificates are stored in the Ethereum blockchain, they are not secret, immutable, and not manipulable. Moreover, a mobile app will enable a fast and easy authentication through a QR code authentication system. The method minimizes the chances of undesirable changes, and eliminates the need of centralized powers. The performance testing is done on the basis of the verification time, gas consumption and success rate. The results of the experiment indicate that the proposed approach is more effective and safer than the traditional systems, and verification time is 20 ms and a constant success rate is 100. The proposed architecture enhances trust between employers and learning institutions by providing a safe and dependable system of trustful digital certificates management.

Keywords: blockchain, digital certificate, hashing, a chaotic algorithm, Verification and Validation, Ethereum, Student.

ISAIED2026/74

Smart Surveillance System for Monitoring Multidrug-Resistant Infections in Healthcare Settings

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ISBN: 978-93-5782-039-4

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Abstract

Abstract: Patho Trace is a digital contact tracing system designed to monitor and control the spread of multidrug resistant (MDR) pathogens in hospital settings. It integrates real-time data from doctors, pharmacists, laboratories, and environmental teams, using AI-driven analytics and wearable technologies for contact and environmental surveillance. This cloud-based platform enhances infection control, antibiotic stewardship, and hospital safety by providing timely alerts and tracking prescriptions and interactions within the hospital environment.

Keywords: Digital contact tracing, Multidrug-resistant pathogens, Hospital infection control, antimicrobial stewardship, AI analytics, Wearable technology, Real-time surveillance, Antibiotic resistance, Healthcare-associated infections, Environmental monitoring.

ISAIED2026/75

A Review on SHM (MEMS) and NDT Fusion Method for Damage Prediction Level in RC Beam Structure

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Abstract

Structural Health Monitoring (SHM) combined with Non-Destructive Testing (NDT) offers a powerful approach for detecting and assessing structural damage early, ensuring the safety and longevity of critical infrastructure. For reinforced concrete infrastructure, superior damage prediction capabilities are promised by combining affordable MEMS-based structural health monitoring (SHM) with non-destructive testing (NDT) techniques; however, algorithm selection remains debatable. This critical

ISBN: 978-93-5782-039-4

study compares fusion designs in terms of performance, interpretability, and deployment practicality, synthesising data from 41 investigations (2018–2026). The above studies demonstrate the fact that hybrid feature-decision fusion methodologies prove the ideal balance, preserving engineering interpretability while increasing prediction accuracy by 22% over single-modality baselines. Though deep learning techniques perform well in controlled laboratory environments, they bear the risk of overfitting when dealing with small RC beam datasets. From the review, four priority gaps are identified, which are as follows. (1) Absence of MEMS noise characterisation in fusion design, (2) lack of validation studies for small-scale RC beams (100x100x700 mm), (3) inconsistent damage state definitions across research, (4) lack of standardised fusion performance. We outline a plan focusing on free multimodal datasets, standard tests for algorithms, lab-scale frame to validate the proposed approach.
Keywords: Structural Health Monitoring (SHM); Non-Destructive Testing (NDT); MEMS Micro-Electro-Mechanical Systems; Data Fusion.

ISAIED2026/76

TelecomIQ: An Explainable AI Framework for Predictive Telecom Analytics and Network Management

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Abstract

The telecommunications industry is undergoing a major transformation driven by the rapid rollout of 5G networks, the growth of Internet of Things (IoT) devices, and evolving consumer behaviour, generating massive volumes of complex, multidimensional data such as customer demographics, billing records, real-time network telemetry, and service interaction logs; however, telecom operators often struggle to extract actionable insights due to fragmented data sources and limitations of traditional analytics systems, leading to inefficient resource allocation and high customer churn that result in significant financial losses. This study introduces TelecomIQ, an advanced AI-driven telecommunications analytics platform designed to centralize, analyze, and operationalize telecom data for predictive business intelligence and network optimization, moving beyond conventional frameworks that focus on isolated performance metrics by integrating eleven machine learning models into a unified multimodal ecosystem. The platform addresses key operational challenges through specialized predictive techniques, including Gradient Boosting for churn prediction, regression-based Customer Lifetime

ISBN: 978-93-5782-039-4

Value estimation, seasonal time-series forecasting for network demand, Isolation Forest-based anomaly detection, and BERT-inspired sentiment analysis for customer experience monitoring, while enhancing interpretability and decision transparency through the integration of SHAP-based explainability across all prediction modules. TelecomIQ is deployed via eight interactive dashboards—such as Executive, Network, Customer Experience, Financial, and Geographic views built on a Flask-Python architecture and integrated with Chart.js and Leaflet visualization frameworks, and when evaluated on a synthetic relational dataset of 100,000 customers and 1,000 cell towers, the platform demonstrates strong potential to transform traditional telecom operations from reactive management approaches into proactive, predictive, and data-driven intelligence systems.

ISAIED2026/77

EduPing: An Integrated NLP-Driven Framework for Automated Academic Communication and Intelligent Notification Delivery

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Abstract

Academic institutions face persistent challenges in disseminating time-sensitive information owing to fragmented communication channels, verbose messaging, and the absence of automated delivery mechanisms. This paper presents EduPing, a novel end-to-end framework that integrates NLP-based message summarization with automated WhatsApp delivery to streamline institutional communication. Unlike prior approaches that address isolated sub-tasks such as named-entity recognition or event classification, EduPing employs a locally deployed large language model (Phi-2 via Ollama) for zero-shot, prompt-guided summarization producing concise, student-ready notifications while ensuring all institutional data remains strictly on-premises. The system introduces an OTP-based WhatsApp Web authentication mechanism with persistent browser-profile session management, eliminating QR-code dependencies and enabling fully autonomous background delivery on headless institutional servers. A hybrid reliability architecture pairs AI-driven summarization with deterministic regex-based fallback extraction, maintaining output validity and robustness even when model inference produces malformed responses. Evaluated on 150

ISBN: 978-93-5782-039-4

real academic announcements across five message categories, delivered to 200 recipients, EduPing achieves a 93.1% summarization F1-score, 96.0% delivery success rate, and a mean end-to-end processing time of 2.3 seconds per message — outperforming both a rule-based regex baseline (76.4% F1) and a supervised BiLSTM-CRF model (88.2% F1) requiring GPU training. These results confirm EduPing & suitability for real-world institutional deployment without GPU infrastructure, cloud subscriptions, or labelled training data, offering a privacy-preserving, cost-neutral solution for AI-driven academic communication.

ISAIED2026/78

Sustainable AI: Evaluating Energy Efficiency in Machine Learning Models

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Abstract

This study addresses the increasing energy consumption and environmental impact of modern machine learning systems. Existing research largely emphasizes high-accuracy deep learning models, often neglecting computational cost and sustainability concerns. To address this gap, the paper presents a comparative analysis of lightweight machine learning algorithms, including Logistic Regression, Decision Trees, and K-Nearest Neighbours. Energy usage and carbon emissions are measured using the Code Carbon tool during model training and inference. The results demonstrate that simpler models can achieve competitive performance with significantly lower energy consumption, highlighting their potential for building sustainable, cost-effective, and accessible AI systems.

ISAIED2026/79

AI TEACHING ASSITANT LEVERAGING RETRIEVAL-AUGMENTED GENERATION AND LECTURE TRANSCRIPTS

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Abstract

This project focuses on developing an AI-based Teaching Assistant that helps students learn more efficiently from lecture videos. In traditional learning,

ISBN: 978-93-5782-039-4

students spend a lot of time watching full lectures or searching manually to find specific information. This process is slow and not very effective. To solve this problem, our system uses modern Artificial Intelligence techniques to quickly understand and retrieve useful information from lecture content. The system works by first converting lecture videos into text using speech-to-text technology. This text is then divided into smaller parts and converted into embeddings, which help the system understand the meaning of the content. When a user asks a question, the system compares the query with stored lecture data and finds the most relevant parts. We use a technique called Retrieval-Augmented Generation (RAG), which combines information retrieval with a language model to generate accurate answers. This ensures that the responses are based only on lecture content, reducing incorrect or misleading information. The system also provides timestamps, allowing users to directly locate the exact part of the lecture. The developed system is fast, efficient, and user-friendly. It reduces the time required to search for information and improves learning experience. Overall, this project demonstrates how AI can be used to create smart educational tools that make learning easier, interactive, and more accessible for students.

ISAIED2026/80

Generative AI Models

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Abstract

During the last two years, a plethora of large generative models such as ChatGPT or Stable Diffusion have been published. Generative AI models are getting adapted by every industry level workspace. These models are used to increase efficiency and productivity and fuse with human intellect to help understand the complex-level structures and networks in an industry. Generative AI models are capable of performing a wide variety of tasks that have traditionally required creativity and human understanding. Consequently, the implications of these generative models in industry and society are enormous, as several job positions may be transformed. For example, GPT -4o by Open AI – takes a leap forward in the evolution of AI models, enabling users to create text-to-image and advanced multimodal reasoning. Claude 3.7 Sonnet by Anthropic enhances conversational AI capabilities. StyleGAN2 by Nvidia to create photorealistic image generation. Codex by Open AI – is being widely used for code generation and assistance.

ISBN: 978-93-5782-039-4

MuseNet and Jukebox to create AI generated music . This work consists on an attempt to describe in a concise way how the main models.

ISAIED2026/81

Determinants of Effective AI-Driven Personalized Learning: A Study of Higher Education Institutions in Goa

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Abstract

The education sector is changing with the implementation of the personalized learning systems by the use of Artificial Intelligence (AI) which adjusts the teaching approaches and the material to meet the needs of each individual student. AI-driven learning platforms are becoming popular in Goan institution of higher learning to enhance student engagement, learning efficiency and academic performance. The effectiveness of these systems however has a number of vital determinants. The paper will analyze the factors that determine successful AI-mediated personalized learning at institutions of higher learning in Goa. The study is based on the variables of student traits, technology-related issues, teacher engagement, curriculum alignment and ethical issues. Determinants related to the students such as motivation, prior knowledge, self-regulation and learning preferences are examined in order to comprehend their impact on AI-backed learning. The usability, accessibility, adaptability and accuracy of AI systems are also explored as technological factors. The paper also examines how the teacher can incorporate AI in learning and ensure it does not go against the goals of the curriculum. Ethical issues such as privacy of data, transparency, and bias in the algorithm are also viewed as important influencing factors on trust and adoption of AI in education. The research results can guide the educational institutions in Goa to create more efficient and responsible AI-based learning settings.

Keywords: Artificial Intelligence (AI), Personalized Learning, Higher Education, Student Engagement, Academic Performance.

ISAIED2026/82

EduVidGen: AI-Based Text-to Video Educational Application

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ISBN: 978-93-5782-039-4

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Abstract

The AI-based Text to Video application – EduVidGen, strives to solve the commonly faced issues in the video recording and video editing world, mainly in the educational domain, with the help of AI and automation. Since AI text-to-video is a huge spectrum which is a research-intensive topic that is currently being studied worldwide, it surely does have a lot of scope and potential in finding solutions throughout many subjects and fields. Since it is massive, the focal point of EduVidGen is to generate videos within the compass of Linear Data Structures concepts, in order to demonstrate how a unique pipeline aims to dive deep into the world of automation to generate videos locally. If we exclude the educational context of this project, many existing text-to-video applications mostly use diffusion models to generate rather smaller videos or GIFs, that mainly attempts to improve the temporal consistency and clarity of the videos, in other words, focus only on one of the aspects of our pipeline. This is the major research gap that is being dealt with. The existing applications have a completely different goal and approach in solving such issues. The objective of this project is to combine every critical stage of almost every existing application, and create a basic pipeline that tries to solve the issues that are not yet being properly discussed in the domain of AI text-to-video. The stages comprising the unique pipeline starts with script generation, html generation, snapshot generation, speech generation and finally, video compilation which combines all the above stages. This is achieved delicately in order to ensure that there is no heavy overloading on any stage and that all the stages are neatly balanced. Although it provides a basic outline and base in producing videos like an instructor or an expert in that field is explaining the concepts, it can still be enhanced further with the use of APIs and strong LLM models, along with diagram generation which further simplifies the concepts in a simpler fashion. Along with which, it is crucial to understand that as we are dealing with Large Language Models, there can be times that the content being generated may not always stick to the actual expectation of the narrative and might lead to the model hallucinating. Also, the audio generation models and video generation models can also be improved with the right, concrete models which can further improve it and customize it. And the vastness of the concepts chosen can also further be expanded with time and right models and techniques.

ISBN: 978-93-5782-039-4

ISAIED2026/83

Buddy AI: An Ethical and Technical Case Study of Voice-Driven Pediatric ESL Tutoring

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Abstract

Voice-driven intelligent tutoring systems hold significant promise for early childhood language education, yet building them raises substantial technical and ethical challenges that remain underexplored. This paper presents a combined technical and ethical case study of Buddy AI, a mobile-based conversational tutoring system designed to teach spoken English to children aged 4–10 through real-time voice interaction with an animated 3D character. On the technical side, we examine the system's architecture, which chains a Conformer-based automatic speech recognition engine optimised for children's speech, a DistilBERT intent classifier, and a non-autoregressive neural text-to-speech module into a sub-second inference pipeline. The system is further supported by a curriculum aligned with the Common European Framework of Reference for Languages, spanning Pre-A1 to A2 proficiency levels, making it accessible to children with no prior English exposure. On the ethical side, we apply the framework proposed by Agarwal et al., which identifies six principal ethical values for AI in education, namely non-discrimination, data stewardship, human oversight, good will, explicability, and educational aptness, and evaluate Buddy AI's design against each of these values. Our analysis finds that the platform performs well in terms of data stewardship, goodwill, and educational aptness, owing to its closed-graph safety architecture, child-friendly low-anxiety design, and CEFR-aligned curriculum structure. However, it falls short in terms of non-discrimination due to accent bias present in its ASR training corpora, in terms of explicability due to the opacity of its proprietary speech recognition system, and in terms of human oversight due to limited mechanisms for parental or teacher involvement in monitoring or intervening in system decisions. We further conduct a structured comparison against Duolingo Max and ELSA Speak, highlighting Buddy AI's distinct voice-first approach and

ISBN: 978-93-5782-039-4

its suitability for pre-literate learners, a demographic that text-centric plat forms do not adequately serve. Finally, we outline concrete directions for future improvement including federated accent adaptation, phoneme-level pronunciation scoring, and on-device language model integration, where technical and ethical considerations converge.

Keywords: intelligent tutoring systems, pediatric speech recognition, conversational AI, natural language processing, ESL education, ethics of AI in education, Conformer, BERT.

ISAIED2026/84

Sustainable Biomass Derived Nanocomposites for Catalysis and Advanced Electrochemical Sensing of Pharmaceutical Compounds: A Comprehensive Review

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Abstract

The analysis of pharmaceutical compounds in clinical and environmental samples is of critical importance due to their potential impacts on human health and ecosystems. The growing need for sustainable, effectiveness, and sensitive analytical methods has driven the development of biomass derived electrochemical sensors as a green alternative to conventional analytical platforms. This review highlights the design, synthesis, and application of biomass based electrochemical sensors for the individual analysis of six widely used pharmaceutical agents Paracetamol, Dopamine, Diclofenac, Amoxicillin, Ciprofloxacin, and Azithromycin. These sensors utilize biomass derived materials such as activated carbon, biochar, cellulose, and lignin derivatives as electrode modifiers, offering ecofriendly, biodegradable, and efficient sensing interfaces. The modified electrodes exhibit enhanced electrocatalytic activity, large surface area, and excellent adsorption capacity, enabling highly sensitive and selective detection of target analytes even in the presence of potential interferons. Analytical techniques such as Differential Pulse Voltammetry (DPV) and Cyclic Voltammetry (CV) are employed to achieve low detection limits and wide linear response ranges. Overall, this work underscores the promising role of biomass derived nanomaterials in advancing green electrochemical sensor technology for pharmaceutical analysis. The findings demonstrate that biomass-based materials offer a sustainable, cost effective, and high-performance alternative for developing next generation electrochemical sensors for pharmaceutical monitoring.

ISBN: 978-93-5782-039-4

Keywords: Biomass, Paracetamol, Dopamine, Diclofenac, Amoxicillin, Ciprofloxacin, Azithromycin.

ISAIED2026/85

Secure Image Communication using Hybrid Chaos and Deep Learning

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Abstract

In this work, a new hybrid technique is introduced which uses chaos theory along with deep learning algorithms for the protection of images. In today's time when digital image transmission through internet and different other forms of network becomes common, the need to ensure their security increases significantly. Some existing methods like AES and RSA cannot be effectively used to encrypt visual information due to their data redundancy and high pixel correlation properties. This paper suggests a new approach where an autoencoder is combined with a set of chaos-based cryptography processes. Preprocessing of images and their encryption are carried out using chaos-based logistic maps where the autoencoder generates their feature representations while the keys are generated on the basis of session IDs, feature vectors, and hash function. Dynamic key generation allows performing encryption and decryption without storing any secret information on both sender and receiver sides. The performance of the method is measured in terms of various parameters such as entropy, Number of Pixel Change Rate (NPCR), Unified Average Changing Intensity (UACI), Mean Squared Error (MSE), Peak Signal-to-Noise Ratio (PSNR), and Structural

ISBN: 978-93-5782-039-4

Similarity Index Measure (SSIM). The results of simulation show a high level of encryption and acceptable level of decryption performance. Further improvements in the suggested method can be made in future for research purposes and publishing of results.

ISAIED2026/91

AI-Driven Optimization for Scalable Battery Manufacturing

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Abstract

As the world shifts to electrification, battery innovation must accelerate, moving away from trial-and-error and toward AI- and data-driven methods. This review explores how Artificial Intelligence (AI) and Machine Learning (ML) support the battery life cycle, with a focus on making manufacturing more scalable and boosting giga factory output. Tools like Generative AI, Physics-Informed Neural Networks (PINNs), and Bayesian optimization now let researchers reduce the time from discovery to production from decades to just months. In manufacturing, AI helps increase yields. Digital Twins, which are virtual models of production lines that use real-time sensor data and computer vision, help detect defects during electrode coating and calendaring. These tools also enable predictive maintenance and automatic process adjustments, which lower scrap rates in large-scale production. Reinforcement Learning (RL) is used to improve battery formation and Battery Management Systems (BMS), helping large energy storage systems stay safe and last longer with smart, real-time diagnostics. Beyond manufacturing, AI-driven circular-economy strategies are changing the value chain by automating recycling and making supply chains more resilient. Recent advances include using ML to identify solid-state electrolytes more quickly and developing AI-based fast-charging methods that reduce thermal damage. However, challenges remain in making data more compatible (FAIR principles) and managing the carbon footprint of large AI models. This review presents a strategic plan for 2025 to 2040, focusing on the shift to Autonomous Laboratories and Quantum-Informed ML. Deep AI integration is not meant to replace electrochemistry, but is essential for scaling up advanced battery technologies needed for global decarbonization.

ISBN: 978-93-5782-039-4

Keywords: Digital Twins, Battery Manufacturing, Gigafactory Scalability, Battery Management Systems, Autonomous Laboratories

ISAIED2026/86

AI-Driven Airline Demand Forecasting and Revenue Optimization System

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Abstract

The airline industry operates under stringent profit margins, requiring accurate demand forecasting and revenue optimization strategies. This paper presents the design and implementation of an AI-driven Airline Revenue Optimization and Flight Demand Forecasting System, developed as an end-to-end data analytics platform for improved decision-making in domestic aviation operations. The proposed system integrates machine learning models, time-series forecasting techniques, and optimization algorithms to analyse passenger demand and enhance pricing strategies. A multi-factor dynamic pricing engine adjusts fares based on demand patterns, seasonal variations, booking horizons, and market conditions. A Monte Carlo–based overbooking simulation determines optimal overbooking limits, reducing revenue loss from passenger no-shows while maintaining service efficiency. Additionally, multi-objective Pareto optimization is applied for route-level profitability analysis. To ensure scalability and reliability, the platform adopts a star-schema data warehouse architecture with automated ETL pipelines and data validation mechanisms. Model transparency and robustness are improved through SHAP-based explain ability, Population Stability Index (PSI) for data drift detection, and walk-forward validation for time-series models. The system also incorporates seasonal demand indicators, including major Indian festivals, within a 365-day pricing framework. A centralized Revenue Command Centre dashboard provides real-time analytics and key performance indicators for monitoring airline performance. Experimental results demonstrate strong predictive performance, achieving demand forecasting accuracy with MAPE below 10%, churn prediction AUC-ROC of 0.87, and route profitability prediction R2 exceeding 0.90.

ISAIED2026/87

Multimodal Emotion Recognition and Recommendation System for Enhanced Classroom Feedback

HAMSA CS

ISBN: 978-93-5782-039-4

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Abstract

This paper presents a novel Multimodal Emotion Recognition and Recommendation System aimed at enhancing classroom feedback mechanism and improving teaching quality. Traditional feedback systems often depend on inputs that are late and subjective, which makes it hard for them to capture students' real-time engagement and emotional responses. To fix this the proposed system gets feedback from students by recording videos after each lecture. This way evaluation can happen all the time. The system analyses both what it sees and hears. It looks at expressions to understand how someone is feeling. It also transcribes spoken feedback and processes it using a model and natural language techniques to find sentiment and meaning. By combining these types of feedback the system creates a score that shows both how engaged students are emotionally and how well they understand. A dual-interface architecture helps students and teachers communicate easily. Teachers can see real-time data find gaps in learning and improve their teaching. A conversational agent, which uses AI helps resolve doubts and provides personalized help. The system is designed to be scalable, flexible and work well, in smart classrooms.

ISAIED2026/88

AI Interview Coach with Resume-Based Question Generation and Multimodal Confidence Analysis

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Abstract

The recruitment process generally misses out on personalized feedback and evaluation of the performance of candidates during interviews. This project involves an AI Interview Coach system designed to provide automated interview practice and evaluation using multimodal analysis. In the system design, questions are generated automatically based on the user's resume

ISBN: 978-93-5782-039-4

using generative AI (Gemini). Responses provided are recorded in the form of audio and video and converted to text format using Whisper. Relevance scores of the responses provided are generated using natural language processing techniques like Sentence-BERT and cosine similarity. Also, confidence and engagement scores of the user's responses are evaluated based on the analysis of their facial expression and emotions using computer vision techniques. A comprehensive score will be provided in the form of feedback generated by combining the above factors using an interactive dashboard. The suggested system integrates multiple AI techniques into one application to enable scalable solutions to help candidates prepare for interviews. It gives candidates insight into their areas of strength and weakness to improve their communication skills and build up confidence. Possible future enhancements are real-time feedback, integration of the system as a web-based application.

Keywords: Artificial Intelligence, Interview Automation, Natural Language Processing, Speech Recognition, Emotion Detection, Multimodal Analysis.

ISAIED2026/89

Real Time Threat Detection Incident Response and Adaptive Security Posture Management using Agentic AI

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Recent network infrastructures are increasingly vulnerable to sophisticated cyber threats such as distributed denial-of-service attacks, port scanning, and anomalous traffic behaviors, necessitating accurate and real-time detection mechanisms. Conventional intrusion detection approaches, often based on static signatures or rule-based systems, fail to adapt to dynamic attack patterns and generate high false positives. To overcome these challenges, an intelligent framework integrating machine learning, deep learning, and agentic artificial intelligence is developed for real-time network traffic analysis. The system captures live packets using Wireshark, performs flow-based feature extraction, and applies preprocessing techniques including encoding and standardization. Multiple models, including Random Forest, XGBoost, LSTM, and Autoencoder, are evaluated, followed by an ensemble voting classifier for robust prediction. A Flaskbased deployment pipeline enables continuous monitoring, while an agentic AI layer utilizes a lightweight language model to assess risk levels and automate responses such as blocking malicious IPs or issuing alerts. Experimental results demonstrate that the ensemble model achieves 100% accuracy, precision, recall, and F1-

ISBN: 978-93-5782-039-4

score, outperforming all other models. This framework enables efficient, adaptive, and automated cybersecurity defense in real-time environments.

ISAIED2026/90

An AI-Driven Intelligent Energy Management System for Heterogeneous Commercial Real Estate Portfolios

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Abstract

Commercial real estate contributes nearly 40% of global building-related carbon emissions and is under growing pressure from rising energy prices, regulatory requirements, and corporate net-zero targets. This study develops an Intelligent Energy Management System (IEMS) to coordinate energy flows across a portfolio of five heterogeneous commercial buildings: office, residential, mall, office, and hospital. The proposed architecture integrates multiple AI-driven modules for forecasting, optimization, anomaly detection, and asset management. LSTM models forecast hourly and sub-hourly energy consumption using historical smart meter data, Wi-Fi-based occupancy analytics, weather data, and building management system logs. Prophet captures seasonal patterns to support budget planning and renewable procurement, while XGBoost and Random Forest models predict peak demand. Isolation Forest detects anomalies such as equipment malfunctions, meter errors, and unauthorized usage at both asset and portfolio levels. A Random Forest classifier predicts HVAC and chiller failures within 30 days, and K-means clustering groups buildings according to energy efficiency performance. In addition, a Random Forest model forecasts next-day solar generation and supports battery storage optimization to reduce grid dependency. A rule-based control strategy expands comfort thresholds during low-occupancy periods and shifts loads through pre-conditioning during off-peak hours, reducing peak demand by 20% and total energy costs by 8.16%. Forecasting performance also improved through a hybrid SARIMA-LSTM ensemble, reducing RMSE from 32.66 to 27.67, approximately 15%, while maintaining stable MAE across short- and long-term horizons. The framework offers a scalable blueprint for low-carbon, adaptive building portfolio management.

Keywords: LSTM, SARIMA, Random Forest, K-means Clustering, Isolation Forest, Heuristic, XGBoost.

ISAIED2026/92

ISBN: 978-93-5782-039-4

Ethical Reflection of AI in Human Resource Management

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Abstract

The Artificial Intelligence, in human resource management is involved changes how HR works by making it more effective and giving data-driven insights to the managers. But the moral issues importantly brings by this new technology, specifically when it comes to openness, fairness, responsibility and privacy. Ethical AI in HRM highlight the need to think up and use AI system in responsible way to make sure that employees are not disfavour against, their privacy is guarded and choices are made in a smooth way. This abstract talks about the theme behind ethical AI in human resource management, namely the need to turn down the bias, have human supervision and go after legal and moral rules. An organisation can use AI to upgrade HR practices while building assurance, belief, diversity and respect for employee morale if they put ethics first to attain best result. Keywords: Artificial Intelligence, HRM, Ethical, Bias, Technology, HR practices.

ISAIED2026/93

The AI-Enhanced Research Ecosystem: Integrating Generative Models and Interactive Simulations for Advanced Science Education

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Abstract

The growing use of Generative Artificial Intelligence (GPAI) is beginning to influence the way scientific research is carried out and how postgraduate teaching is approached. This work outlines a practical research ecosystem that brings together widely used AI tools such as ChatGPT, Gemini, GPAI and Perplexity AI along with more specialized academic platforms to support each stage of the research process. Tools like SciSpace, Elicit, and Consensus help researchers deal with the rapidly expanding body of scientific literature by making it easier to search, filter, and summarize relevant studies in less time. At the stage of writing and publication, platforms such as Paperpal and Thesify assist in improving the clarity, organization, and overall quality of manuscripts, while also ensuring compliance with journal standards. For visual representation, tools like GPAI, BioRender and SciDraw enable clear

ISBN: 978-93-5782-039-4

and effective presentation of complex scientific ideas through figures and graphical abstracts and few are all in one AI agent designed for learners from elementary to research level. In teaching, interactive platforms such as PhET Interactive Simulations and JavaLab allow students to explore concepts through virtual experiments, encouraging better understanding and engagement. Taken together, this integrated approach reflects a gradual shift towards a more flexible and digitally supported scientific environment, where AI tools assist rather than replace human thinking, improving efficiency, communication, and learning in higher education.

Keywords: Generative Artificial Intelligence, Research Ecosystem, Scientific Communication, Higher Education, Digital Learning;

ISAIED2026/94

An Improved Framework for Thyroid Detection Using Machine Learning Algorithm

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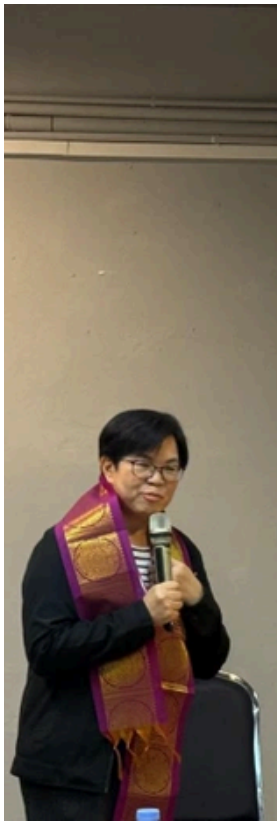
Abstract

Presently Thyroid is a disease that touches on almost every part of the body hence making it challenging to the doctors and the nurses to cope. The normal methods of diagnosing this fatal illness are normally difficult and time consuming. A data-driven solution is also able to give you a predicted solution, but it is very expensive to examine all the significant qualities in terms of computing power. In this study, the authors have used the Thyroid Disease data to design an Intelligent Thyroid Diagnosis System that makes use of multiple ensemble and explainable algorithms in order to enhance the accuracy of the diagnosis. It employs the finest ensemble strategies such as a Voting Classifier that utilizes RF, Decision Tree, and Gradient Boosting with soft voting, a Bagging approach that employs RF, and a Stacking approach that employs Random Forest, Decision Tree, Gradient Boosting, and AdaBoost with LightGBM. Algorithms available in the system are also the RF, Decision Tree, Gradient Boosting and AdaBoost. We also consider the model of 3SHANN and Voting Classifier on ExtraTree and Boosted Decision Tree. It should be highlighted that Voting Classifier (Boosted Decision Tree + ExtraTree) was the most successful, and the accuracy rates were 100 percent. This indicates the effectiveness of ensemble method in the diagnosis of thyroid condition.

ISBN: 978-93-5782-039-4









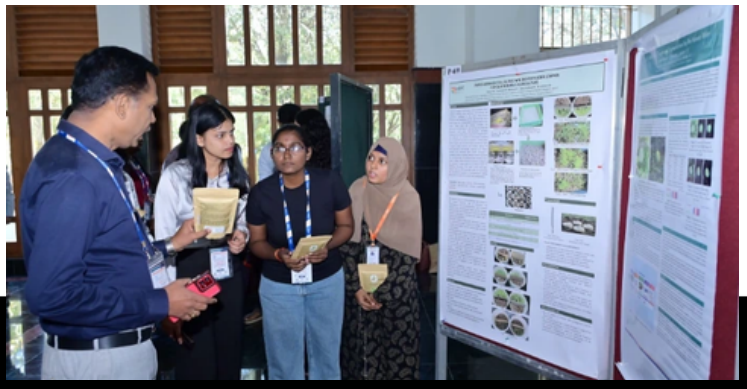












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