

Theni Melapettai Hindu Nadargal Uravinmurai



# NADAR SARASWATHI COLLEGE OF ENGINEERING & TECHNOLOGY



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International Conference on Recent Trends in  
Technology

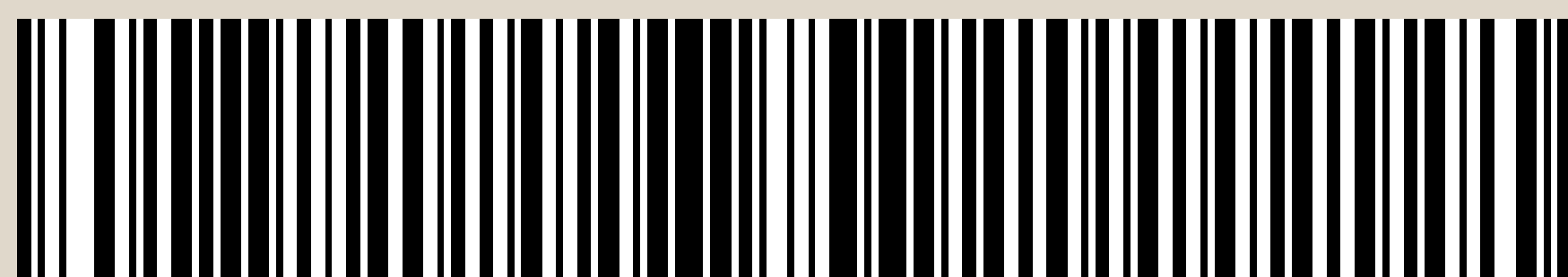
**“ICRTT - 2K26”**

Departments of CSE, AI&DS and IT

Editor

Dr. M. Sathya, M.Tech., Ph.D. – Vice Principal

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978-93-5782-233-6

**BOOK OF PROCEEDINGS**

**“ICRTT - 2K26”**

**International Conference on Recent  
Trends in Technology**

**17.04.2026**

**Organized by**

**DEPARTMENTS OF CSE, AI&DS AND IT**

# **ABOUT TMHNU**

**"Genesis of Theni Melapettai Hindu Nadargal Uravinmurai Since 1898" Theni Melapettai Hindu Nadargal Uravinmurai (TMHNU) proclaims to society its tremendous service in providing quality education. The pioneers of TMHNU (1898) started the primary school in 1919, named Nadar Saraswathi Vidhyasala, with 38 students and 2 teachers.**

**Now, that small seed has flourished into a large tree. With the blessings of Annai Sri Bathrakaliamman, 17 educational institutions now function under this bower, providing quality education. Over 22,000 students study here, with more than 1,000 teaching and 1,000 supportive staff members.**

# **GOVERNING CELL OF TMHNU**



**Mr. A. S. G. Dharmarajan, B.A.,  
President**

It is with great pride that I welcome you to the International Conference on Recent Trends in Technology, organized by the Faculty of Computer Science and Engineering (CSE, IT, and AIDS). This conference provides a distinguished platform for researchers, academicians, and industry professionals to share knowledge, exchange ideas, and present innovative research in emerging technological domains. The wide spectrum of topics—ranging from Artificial Intelligence & Machine Learning, Data Science & Big Data, Internet of Things (IoT), Cyber Security & Blockchain, to Cloud & Edge Computing, Software Engineering, Computer Networks, Human Computer Interaction, and Green Computing—reflects the dynamic and evolving nature of technology.

I commend the efforts of the organizing committee, faculty members, and students for their dedication in making this conference a success. I also extend my sincere appreciation to all authors whose valuable contributions have enriched these proceedings. I am confident that this conference will foster innovation, collaboration, and meaningful advancements in technology.

# **GOVERNING CELL OF TMHNU**



**Mr. A. S. Jeevagan**  
**Vice President**

I am pleased to extend my greetings on the occasion of the International Conference on Recent Trends in Technology, organized by the Faculty of Computer Science and Engineering (CSE, IT, and AIDS). This conference highlights the importance of interdisciplinary collaboration in addressing modern technological challenges.

The proceedings present a collection of high-quality research contributions that demonstrate both academic rigor and practical relevance across diverse domains. I congratulate all the authors, participants, and organizers for their commendable efforts. I am confident that the knowledge shared through this conference will contribute significantly to future technological advancements.

# **GOVERNING CELL OF TMHNU**



**Mr. M.M. Anandhavel, M.B.A.,  
General Secretary**

**It is an honour to contribute to the organization of the International Conference on Recent Trends in Technology, conducted by the Faculty of Computer Science and Engineering (CSE, IT, and AIDS). The conference has provided an excellent platform for intellectual exchange and collaboration among researchers, academicians, and industry experts.**

**The proceedings include a collection of well-researched papers that reflect innovation, technical depth, and practical significance. I express my sincere gratitude to all contributors, reviewers, session coordinators, and volunteers whose efforts made this event possible. I am confident that this conference will have a lasting academic and professional impact.**

# **GOVERNING CELL OF TMHNU**



**Mr. B. Ramachandran, M.B.A.,  
Treasurer**

I am pleased to be associated with the International Conference on Recent Trends in Technology, organized by the Faculty of Computer Science and Engineering (CSE, IT, and AIDS). The successful conduct of this conference reflects effective planning, coordination, and teamwork.

The proceedings showcase valuable research contributions across multiple technological domains, highlighting innovation and academic excellence. I extend my sincere thanks to all participants, sponsors, and organizing members for their support and cooperation. I am confident that this conference will contribute meaningfully to the advancement of research and innovation in technology.

# ABOUT NSCET



**Nadar Saraswathi College of Engineering and Technology was established in 2010 to uplift rural students and nurture them with excellence. Located on a 21-acre eco-friendly campus near Theni, the institution focuses on molding outstanding engineers as responsible citizens and professionals. In today's world, there is a genuine need for an institute that provides quality academic and career education in a personalized atmosphere.**

**NSCET offers programs that prepare students for successful employment through quality teaching, learning, and research. Our goal is to equip students with lifelong knowledge, skills, and credentials for professional advancement at any point in their careers. Excellence in teaching remains our most important criterion for faculty recruitment. Our faculty are also engaged in continuous research, scholarly work, and service to the region and state. The college offers comprehensive support services to ensure student success**

# ***Prominent Personalities of NSCET***



**Er. A.S.S.S. Soma Sundaram, B.E.,  
Secretary**

It gives me great pleasure to present the proceedings of the International Conference on Recent Trends in Technology, organized by the Faculty of Computer Science and Engineering (CSE, IT, and AIDS). The conference received an encouraging response from researchers and professionals across various regions.

The selected papers included in these proceedings cover emerging areas such as Artificial Intelligence & Machine Learning, Data Science & Big Data, IoT, Cyber Security & Blockchain, Cloud & Edge Computing, Software Engineering, Computer Networks, Human Computer Interaction, and Green Computing. Each paper has undergone a rigorous peer-review process to ensure quality, originality, and relevance. I sincerely thank the reviewers, authors, and organizing team for their valuable contributions and commitment. I believe these proceedings will serve as a valuable resource for researchers, academicians, and practitioners in the field of technology.

# ***Prominent Personalities of NSCET***



**Mr.T.Subramani, B.C.A., M.B.A.,  
Joint Secretary**

**It is a privilege to be associated with the International Conference on Recent Trends in Technology, organized by the Faculty of Computer Science and Engineering (CSE, IT, and AIDS). This conference has brought together a diverse community of researchers and professionals, providing a platform to share innovative ideas and discuss recent developments in technology.**

**The proceedings reflect the collective efforts of contributors who have presented insightful and impactful research work. I extend my sincere appreciation to all authors, reviewers, and organizing members for their dedication and support. I hope that these proceedings will inspire continued research and collaboration in emerging technological domains.**

# ***Prominent Personalities of NSCET***



**Dr. C. Mathalai Sundaram, M.E., M.B.A., Ph.D., MISTE.,  
Principal**

**It is my immense pleasure to welcome all participants, academicians, and industry experts to ICRTT-2026. Our college has always aimed to bridge the gap between theoretical knowledge and practical innovation.**

**The theme, Recent Trends in Technology, is perfectly aligned with this vision. I trust that the deliberations and discussions held here will leave a lasting impact on all of us and contribute meaningfully to the global knowledge pool.**

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## **High Accurate Blood Cancer Detection Model with Deep Learning**

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### **ABSTRACT:**

Cancer remains one of the leading causes of death globally, and early detection, along with lifestyle awareness, is critical for reducing its impact. This project introduces OncoSense, an intelligent healthcare platform that leverages Artificial Intelligence (AI) to assess cancer risk and provide preventive guidance. OncoSense integrates multiple data sources, including medical imaging, dietary habits, lifestyle factors, and family medical history, to deliver personalized risk predictions. The system employs advanced AI techniques such as Convolutional Neural Networks (CNNs), Vision Transformers, and U-Net segmentation models to analyze medical images, detect abnormal cells, and identify potential tumor patterns with high accuracy. Beyond image analysis, OncoSense connects to real-time medical databases to provide users with up-to-date information on cancer research, treatment options, and preventive strategies. Through a user-friendly web interface, individuals can upload medical scans, input health details, track lifestyle and dietary patterns, and view AI-generated risk assessments via intuitive visual dashboards. By combining AI-driven analysis, web technologies, and real-time medical data integration, OncoSense demonstrates a comprehensive approach to early cancer awareness, risk monitoring, and preventive healthcare. The platform aims to empower users with knowledge, enabling proactive health management and potentially reducing cancer-related mortality.

### **KEYWORDS:**

Blood Cancer, Deep Learning, CNN, U-Net, Vision Transformer, Medical Imaging

**TripEase AI: Design and Development of an Agentic Artificial Intelligence  
Platform for Personalized Travel Recommendation and Trip Planning**

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**ABSTRACT**

Trip planning involves multiple complex decisions such as destination selection, budgeting, and scheduling. Traditional systems often lack personalization and adaptability to user needs. This paper presents TripEase AI, an Agentic Artificial Intelligence-based platform for intelligent travel planning. The system uses a multi-agent architecture where specialized agents handle tasks like intent analysis, recommendation, and itinerary optimization. A central Orchestrator Agent ensures smooth coordination and decision-making. Natural Language Processing (NLP) is used to understand user preferences such as budget, duration, and interests. The platform generates optimized and personalized travel plans dynamically. It is implemented using web technologies including Node.js, Express.js, MongoDB, and OpenAI APIs. The modular design improves scalability, flexibility, and performance. Results show enhanced user experience and reduced planning time. TripEase AI demonstrates the effectiveness of agent-based systems in real-world travel applications

**KEYWORDS:**

Agentic Artificial Intelligence, Travel Recommendation, Multi-Agent Systems, NLP, Optimization, Personalized Planning

## **JOB SEARCH ENGINE VIA NORMAL FORMS AND GETTING DETAILS ABOUT JOB AVAILABILITY THROUGH MESSAGES**

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### **ABSTRACT:**

After graduation, individuals aspire to secure a good job and build a bright future. However, achieving this goal requires access to the right opportunities and timely information. In today's competitive market, the demand for skilled and talented individuals is high, and job seekers actively pursue opportunities in their preferred domains to attain career satisfaction. Common methods for job searching include platforms such as LinkedIn, campus recruitment drives, and personal job recommendations.

This project proposes the development of a mobile-based application that simplifies the job search process by providing personalized job opportunities through a user-friendly interface. The application collects essential information from users through a set of structured questions, including their skills, preferences, and location. Based on these inputs, the system filters and identifies relevant job openings.

The unique feature of this application is its ability to deliver job information directly to users via SMS, ensuring accessibility even for individuals with limited internet connectivity. Additionally, the job details can be stored within the user's profile as a document, including employer contact information and other relevant details provided by the recruiters. This solution is particularly beneficial not only for graduates but also for individuals with educational qualifications below a degree level, enabling them to access employment opportunities more easily. By bridging the gap between job seekers and employers, the application aims to enhance employability, improve accessibility to job information, and support individuals in meeting their daily livelihood needs.

### **KEYWORDS:**

**Job Recommendation System , User Profiling , Location-Based Filtering ., SMS Notification System , Mobile Application Development**

## Combating the Fake Media in the Digital Era

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### ABSTRACT

In today's fast-moving digital world, Artificial Intelligence is not just shaping innovation—it's also creating new challenges. One of the most concerning developments is deepfake technology, which allows the creation of highly realistic fake images, videos, and audio. Using deep learning techniques, deepfakes can manipulate faces, mimic voices, and fabricate events so convincingly that even trained eyes struggle to tell what is real and what is not.

As this technology spreads rapidly across social media and online platforms, the risks are becoming impossible to ignore. Deepfakes are now being used to spread misinformation, damage reputations, and misuse personal identities. The line between truth and fabrication is starting to blur, leading to a growing loss of trust in digital content.

This paper focuses on the urgent need to detect and combat deepfake media. It explores modern approaches based on machine learning and deep learning, aiming to identify manipulated content with higher accuracy and reliability. The study also highlights the limitations of current systems and the need for more robust, real-time detection solutions. Ultimately, this work seeks to strengthen digital trust and ensure that technology serves truth rather than distorting it.

### KEYWORDS:

Deepfake Detection, Artificial Intelligence, Deep Learning, Misinformation, Digital forensics, Face Manipulation, Cybersecurity, Media Authenticity, Generative Adversarial Networks (GANs), Fake Media Detection.

## Quantum DNA Pattern Classifier

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### **ABSTRACT:**

The exponential increase in genomic data demands efficient computational techniques for accurate DNA sequence pattern recognition. This paper presents a Quantum DNA Pattern Classifier that integrates quantum computing principles with bioinformatics to enhance the identification of complex nucleotide patterns. DNA sequences are encoded into quantum states via qubit representations, exploiting quantum superposition and entanglement for parallel pattern evaluation. A hybrid quantum-classical framework employing variational quantum circuits coupled with classical optimization is developed to improve classification accuracy and scalability.

The classifier is validated on benchmark genomic datasets for motif detection, gene classification, and mutation identification tasks. Experimental results indicate that the quantum-assisted model achieves competitive accuracy relative to classical machine learning methods, with promising scalability for high dimensional sequence data. The study also discusses potential computational efficiency gains as quantum hardware advances.

### **KEYWORDS:**

Quantum computing, DNA pattern classification, genomic data analysis, quantum machine learning, hybrid quantum-classical models, variational quantum circuits, bioinformatics, gene classification, mutation identification.

## **AI BASED AMONG DEPRESSION DETECTION & AMONG USING DRUG ADDICTION**

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### **ABSTRACT:**

Drug addiction is a serious problem that affects both physical and mental health. Many people who suffer from Substance Use Disorder also experience mental issues like Depression. In most cases, they do not get proper support or early help.

This project introduces a web-based AI system to detect and support people with drug addiction. The system uses face detection to analyze the user's emotions and identify their mental health stage. Based on this, the AI interacts with the user in a friendly and supportive way, like a real person, to understand their feelings better.

The platform also includes a video and reels feature similar to social media, where users can watch motivational and recovery-related content. The system predicts the user's mental condition and provides suitable content from open-source resources to help them improve. Additionally, the system allows users to upload images of people they like or trust, and the AI can interact in a personalized way to make the user feel comfortable and connected. This creates a more engaging and supportive environment.

The main aim of this project is to help drug-addicted individuals recover by using AI-based emotional detection, friendly communication, and personalized support. This system can be used as an early support tool for improving mental health and guiding users towards recovery.

### **KEYWORDS:**

Artificial Intelligence, Depression, Substance Use Disorder, Face Detection, Emotion Recognition, Mental Health Monitoring, AI Chat System, Personalized Support, Addiction Recovery

## **Personalised Recommendation System using Big data**

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### **ABSTRACT**

A Personalized Recommendation System uses Big Data to suggest items that are relevant to a user based on their behavior and preferences. It protects user data by using privacy-preserving methods like federated learning and differential privacy. The system makes sure that recommendations are correct, safe, and can grow. The suggested model uses a hybrid recommendation method that mixes collaborative filtering and content-based filtering to make predictions more accurate. To protect privacy, the system uses advanced methods like data anonymization, differential privacy, and federated learning. The proposed method processes user data locally and only shares encrypted or aggregated information. This lowers the risk of data exposure compared to traditional centralized systems. Also, Big Data technologies are used to efficiently handle large amounts of data in real time. The experimental results show that the system strikes a good balance between privacy and personalization without losing much accuracy. What makes this work unique is that it puts privacy first, which makes it good for real-world applications that need to be secure and scalable.

### **KEYWORDS:**

Privacy preservation, Federated Learning, Data Anonymization, Content-Based Filtering, Secure Data Processing.

## **AI-Based Two-Way Sign Language Communication System With Multilingual Support.**

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### **ABSTRACT**

Due to the lack of a common communication medium, communication between the general population and deaf and mute people is still quite difficult. In order to close the gap between the hearing and hearing-impaired communities, this article suggests an **AI-Based Two-Way Sign Language Communication System with Multilingual Support**. By translating conventional text or speech into equivalent sign language representations and translating sign language motions into text, the technology facilitates bidirectional communication.

A camera is used to record hand gestures, which are then processed in real time using image processing methods and Python's OpenCV package. To increase the accuracy of gesture detection, Gaussian Mixturebased segmentation is used to remove background. To identify movements and translate them into understandable text, a Convolutional Neural Network (CNN) model is used. In order to improve accessibility for a variety of users, the system also incorporates multilingual assistance by translating the generated text into other languages.

The proposed solution aims to provide an efficient, real-time, and user-friendly platform that enhances communication, supports inclusive education, and enables better integration of hearing-impaired individuals into society. Furthermore, the system can be extended for integration with video conferencing platforms to support real-time communication in virtual environments

### **KEYWORDS:**

Artificial Intelligence, Machine Learning, computer Vision, Sign Language Recognition, Speech-toSign Conversion, Multilingual Support, convolutional Neural Network (CNN), Image Processing, Speech Recognition, Assistive Technology, Human-Computer interaction.

## AI-BASED BLOOD GROUP DETECTION USING FINGERPRINT BIOMETRICS

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### **ABSTRACT:**

Blood group identification is an essential process in medical emergencies, blood donation, and healthcare management. Traditional blood group detection methods require laboratory testing, which can be timeconsuming and may not always be available in emergency situations. This paper proposes an Artificial Intelligence-based approach for blood group detection using fingerprint biometrics. The proposed system utilizes fingerprint images captured through biometric sensors and applies image processing and machine learning techniques to analyse unique fingerprint patterns. These patterns are then used to predict the individual's blood group with improved speed and efficiency.

The system involves fingerprint image acquisition, preprocessing, feature extraction, and classification using AI algorithms. A trained machine learning model learns the relationship between fingerprint features and blood group data from a prepared dataset. The proposed method aims to provide a non-invasive, fast, and cost-effective solution for blood group identification. This approach can be particularly useful in emergency healthcare, hospitals, blood banks, and mobile health applications.

Experimental results demonstrate that the proposed AI-based system can achieve reliable accuracy and reduce the time required for blood group detection. The implementation of this technology can enhance healthcare accessibility and improve emergency response by providing instant blood group information.

### **KEYWORDS:**

Artificial Intelligence, Fingerprint Biometrics, Blood Group Detection, Machine Learning, Image Processing, Healthcare Technology

## **A Lightweight Hybrid System for Deepfake and Fake News Detection**

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### **ABSTRACT:**

The quick growth of deepfake technology and the spread of fake news have made it much harder to trust and verify digital information. Most current detection methods use complicated deep learning architectures, like convolutional neural networks and transformer-based models. These methods often need a lot of computing power and make it hard for regular users to access them in real time. This makes it hard for advanced research solutions to be used in everyday situations.

To address this challenge, this paper proposes LiteGuard, a lightweight hybrid detection system designed to identify both textual misinformation and manipulated visual content in a resource-efficient manner. Unlike conventional approaches, the proposed system integrates simple machine learning algorithms, rule-based analysis, and basic image forensics techniques such as error-level analysis to achieve effective detection with reduced computational complexity.

The system is an interactive web-based application that lets users enter news stories or upload pictures and get instant predictions about how real they are. Experimental results show that the suggested method works reliably and takes much less time to process than traditional deep learning-based methods. The system also stresses interpretability by giving clear explanations of its predictions, which builds user trust and openness.

LiteGuard effectively bridges the gap between theoretical research and real-world application by putting accessibility, speed, and usability first. The proposed system helps build digital trust by giving people a useful and easy way to find and stop the spread of fake media.

### **KEYWORDS:**

Deepfake Detection, Fake News Classification, Lightweight Models, Hybrid Approach, Error-Level Analysis, Misinformation Detection

## **ECHOSHIELD-LONG RANGE OFFLINE WOMENS SAFETY ALERT WITH AUDIO CAPTURE**

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### **ABSTRACT:**

EchoShield is an IoT-based wearable safety system that improves women's security in areas with limited or no network connectivity. Traditional safety solutions rely on mobile networks and smartphones, which can be unreliable in remote or emergency situations (Arphan, 2024). EchoShield addresses these challenges by using LoRa communication technology for low-power, long-range, and offline data transmission. The device combines an ESP32 microcontroller, GPS module, LoRa module, and an audio recorder with microSD storage. When activated, it captures real-time location data and ambient audio, then transmits alert information to a receiver unit. The audio recording provides supporting evidence for further analysis. This solution is cost-effective, energy-efficient, and suitable for both urban and rural deployment, offering a reliable and scalable approach to personal safety (Energy efficient mechanism for LoRa networks, 2021).

### **KEYWORDS:**

IoT, Women Safety, LoRa, GPS, Audio Recording, Embedded Systems, Wearable Device, Emergency Alert System, ESP32.

## **FAKE REVIEW DETECTOR USING LLM AND MACHINE LEARNING FORENSICS**

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### **ABSTRACT:**

The “Fake Review Detector” is a comprehensive software solution designed to identify fraudulent, bot-generated, and incentivized e-commerce reviews. By leveraging both state-of-the-art Large Language Models (LLMs) and local machine learning forensics, the system provides a robust, multi-layered approach to protecting brand integrity and consumer trust. The application integrates advanced text analysis, behavioural pattern recognition, and metadata evaluation to accurately detect suspicious review activities. It is capable of identifying AI-generated content, coordinated spam campaigns, and incentivized feedback with high precision. Additionally, the system features a dynamic branding engine that adapts its interface to match the target e-commerce platform, enhancing usability and efficiency for forensic analysts. This intelligent solution ensures trustworthy online shopping experiences by promoting transparency, authenticity, and fairness in digital marketplaces.

### **KEYWORDS:**

Fake Review Detection, Large Language Models (LLMs), Machine Learning, E-commerce Security, AI-generated Content Detection, Consumer Trust.

## AI-BASED TRAFFIC MANAGEMENT SYSTEM

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### ABSTRACT:

Traffic congestion has become a major challenge in urban areas, leading to increased travel time, fuel consumption, and environmental pollution. Traditional traffic signal systems operate on fixed time intervals, which are inefficient in handling real-time traffic variations. This paper proposes an AI-Based Traffic Management System that utilizes computer vision and machine learning techniques to dynamically control traffic signals based on real-time road conditions.

The system uses surveillance cameras to capture live traffic footage at intersections. Advanced object detection algorithms, such as YOLO (You Only Look Once), are applied to identify and count vehicles in each lane. Based on traffic density, the system intelligently adjusts signal timings, giving priority to lanes with higher congestion. This adaptive approach ensures smoother traffic flow and reduces unnecessary waiting time.

Additionally, the system can be extended to detect emergency vehicles and provide immediate signal clearance, improving response times in critical situations. The proposed solution contributes to the development of smart cities by enhancing traffic efficiency, reducing pollution, and improving overall road safety.

In conclusion, the AI-Based Traffic Management System offers a scalable and efficient alternative to conventional traffic control methods by integrating real-time data analysis and intelligent decision-making.

### KEY WORDS:

Smart Traffic Signals, Traffic Density Analysis, Real-Time Data Processing, Intelligent Transportation System (ITS), Automation, Smart Cities.

## **Artificial Intelligence and Machine Learning**

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### **ABSTRACT:**

Artificial Intelligence (AI) and Machine Learning (ML) have emerged as transformative technologies in the healthcare domain, particularly for the early detection and diagnosis of life-threatening diseases such as diabetes and cancer. Traditional diagnostic methods are often time-consuming, expensive, and prone to human error, making automated ML-based approaches a promising alternative. This paper presents a comprehensive survey of machine learning techniques applied to disease detection, with a focus on diabetes and cancer diagnosis. It examines widely used algorithms, including Logistic Regression, Decision Trees, Random Forest, Support Vector Machines (SVM), and Deep Neural Networks, and evaluates their performance on benchmark datasets such as the PIMA Indians Diabetes Dataset and the Wisconsin Breast Cancer Dataset. The analysis highlights the strengths and limitations of each approach, with accuracy rates reported across multiple studies. Furthermore, key challenges in applying ML to healthcare are discussed, including data privacy, class imbalance, and model interpretability. The findings indicate that ensemble methods and deep learning models consistently achieve higher diagnostic accuracy. However, further research is required to enhance model transparency and ensure successful real-world clinical adoption.

## **ACOUSTIC EMISSIONS BASED HEARING LOSS DETECTION FOR NEW BORN BABIES USING EMBEDDED SYSTEM**

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### **ABSTRACT:**

The escalating frequency and intensity of natural disasters globally have underscored the need for innovative and effective disaster response and management strategies. This comprehensive study explores the transformative potential of Artificial Intelligence (AI) in revolutionizing disaster management frameworks. We conduct an in-depth examination of AI applications across the disaster management lifecycle, including prediction and early warning, response and relief, and recovery and mitigation phases. Leveraging case studies such as AI-driven earthquake response in Nepal (2015), flood management in Thailand (2011), and wildfire prediction in California (2018), we highlight AI's capabilities in enhancing situational awareness, optimizing resource allocation, and supporting resilient infrastructure rebuilding. Our analysis reveals that AI-powered technologies, including machine learning, computer vision, and natural language processing, can significantly improve disaster outcomes by enabling timely interventions, reducing false alarms, and facilitating efficient communication. Despite challenges related to data quality, accessibility, and ethics, AI presents unprecedented opportunities for improving disaster resilience and response. This research outlines a roadmap for policymakers, researchers, and practitioners, emphasizing AI's role in building disaster-resilient communities and fostering sustainable development.

### **KEYWORDS:**

Artificial Intelligence, Disaster Management, Disaster Response, AI Applications, Resilience, Prediction, Early Warning, Relief, Mitigation, Sustainability.

**ACOUSTIC EMISSIONS BASED HEARING LOSS DETECTION FOR  
NEW BORN BABIES USING EMBEDDED SYSTEM**

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**ABSTRACT:**

In modern industries and healthcare environments, unexpected equipment failures can lead to severe financial losses and risk to human life. This paper proposes an AI-based predictive maintenance system that leverages machine learning algorithms to monitor equipment performance in real time and predict potential failures before they occur. The system utilizes sensor data such as temperature, vibration, and operational metrics to train models like Random Forest and LSTM networks. By analyzing patterns and anomalies, the proposed solution ensures early fault detection and reduces downtime. Compared to traditional reactive maintenance strategies, this approach significantly improves efficiency, safety, and cost-effectiveness. The study demonstrates how integrating AI into maintenance systems can revolutionize operational reliability across industries.

**KEYWORDS:**

Artificial Intelligence, Machine Learning, Student Drop out Prediction, Predictive Analytics, Early Warning System, Educational Data Mining, Student Retention.

## **A Privacy-Preserving Mobile Data Exposure Analyzer with Behavioral Analytics and Risk Visualization for Android Application**

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### **ABSTRACT:**

The increasing use of mobile applications has led to extensive access and transmission of sensitive user data such as location information, device identifiers, permissions, and behavioral activity. However, most existing mobile security solutions primarily focus on malware detection and do not provide clear insights into how applications handle, share, or expose user data, resulting in limited user awareness and potential privacy risks. To address this limitation, this paper presents a Privacy-Preserving Mobile Data Exposure Analyzer that enables continuous monitoring of data access and transmission behavior without capturing or storing actual user content. The system employs a local VPN-based network monitoring mechanism to observe background data flow, permission usage, and communication with third-party trackers. A behavior analysis component is integrated to identify unusual or unnecessary data access patterns that may indicate potential data exposure. Furthermore, a risk scoring model is designed to evaluate and classify applications based on the level and frequency of data exposure. To enhance interpretability, the system incorporates a visualization module that represents exposure patterns through graphs, heatmaps, and correlation views, allowing users to understand when, where, and how their data is being utilized. Experimental observations indicate that the proposed approach can effectively detect data exposure patterns and provide meaningful insights, thereby improving user awareness and supporting safer interaction with mobile applications while maintaining strict privacy preservation.

### **KEYWORDS:**

Mobile Privacy, Data Exposure Detection, Android Security, Network Traffic Analysis, Data Visualization, Third-Party Tracking, Risk Assessment

## **QUANTUM-RESISTANT CREDENTIAL SYSTEM USING POST- QUANTUM CRYPTOGRAPHY FOR SECURE DIGITAL IDENTITY MANAGEMENT**

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### **ABSTRACT:**

The Quantum-Resistant Credential System (QRCS) is a forward-looking security infrastructure designed to protect digital certificates and verified credentials against the emerging threats posed by future quantum computing technologies. As quantum computers continue to advance, widely-used classical cryptographic algorithms such as RSA and ECC face imminent obsolescence. Algorithms like Shor's algorithm can break RSA-2048 encryption in polynomial time, rendering current digital credential systems cryptographically insecure. This project addresses that critical vulnerability by proposing a hybrid security architecture that integrates post-quantum cryptographic (PQC) algorithms with classical symmetric encryption techniques to achieve both high security and computational efficiency. The system employs CRYSTALS-Kyber for key encapsulation and AES-256 for symmetric encryption, supplemented by SHA-3 hashing for data integrity verification — all of which are either NIST-standardized or recognized finalists in the PQC standardization process. A dual-layer hybrid encryption scheme ensures Credentials remain secure under both current and future threat models: the AES-256 symmetric key is encapsulated using the Kyber KEM, while credential data is encrypted with AES-GCM for performance and confidentiality. The architecture is built on a zero-trust model where every user, device, and access request is continuously authenticated and authorized. Distributed credential verification across multiple independent nodes eliminates centralized single points of failure and ensures tamper-resistant authentication. The system provides secure mechanisms for credential storage, identity verification, and cryptographic key management, ensuring data confidentiality, integrity, and authenticity throughout the entire credential lifecycle. Upon uploading a credential, the system performs document standardization, generates a SHA-3 hash, and validates it against a Global Hash Database to prevent duplication and detect tampering. An AI-based certificate analysis pipeline, incorporating Optical Character Recognition (OCR) and Natural Language

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Processing (NLP) modules, enables automated extraction and validation of credential metadata, facilitating intelligent detection of fraudulent or tampered certificates. The proposed solution is designed with a strong focus on scalability, reliability, and standards compliance, making it suitable for deployment in next-generation identity verification systems, national digital identity frameworks, educational certificate management platforms, and enterprise security ecosystems. This comprehensive quantum-safe platform safeguards digital identities and credentials at scale, offering robust protection both in the present classical computing era and the imminent post-quantum era. The QRCS thus represents a significant step toward future-proof digital trust infrastructure.

### **KEYWORDS:**

Post-Quantum Cryptography, CRYSTALS-Kyber, AES-256, Zero-Trust Architecture, Digital Credential System, SHA-3, Hybrid Encryption, Quantum-Resistant Security.

## DEVELOPMENT OF PORTABLE AI-BASED SENSOR FOR DETECTION OF MICROPLASTICS IN WATER

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### ABSTRACT:

Microplastic contamination in global water bodies has emerged as one of the most critical environmental and public health challenges of the twenty-first century. Plastic particles smaller than 5 millimetres persist in aquatic ecosystems for hundreds of years, accumulating toxic pollutants, disrupting aquatic food chains, and ultimately reaching human populations through drinking water and seafood consumption. Traditional detection methods such as Fourier Transform Infrared (FTIR) spectroscopy, Raman spectroscopy, and manual microscopy, while accurate, are expensive, laboratory-bound, require skilled personnel, and are incapable of delivering real-time, field deployable results. This project addresses these critical limitations through the design and development of a low cost, portable, AI- integrated optical sensor system for realtime detection and classification of microplastics in water. The proposed system introduces water samples into a transparent flow chamber illuminated by a calibrated LED or laser light source. Microplastic particles scatter light in characteristic patterns — determined by their refractive index, surface morphology, and size — that are measurably distinct from those produced by natural organic matter, mineral sediments, and biological particles. These optical signatures are captured in real time by a camera or photodiode array and transmitted to an embedded ESP32 processing unit for on-device analysis, enabling efficient edge computation with minimal power consumption and improved portability. The embedded AI pipeline extracts numerical features from raw optical data — including light intensity distribution, particle size estimation, and shape descriptors — and feeds them into a pre-trained classification model combining Convolutional Neural Networks (CNN) and Support Vector Machine (SVM) approaches. The model classifies each detected particle as microplastic or non-plastic with high accuracy. A real-time decision module monitors classification outputs and triggers configurable alerts when contamination levels exceed defined thresholds, enabling immediate response for environmental monitoring agencies and water treatment facilities. A software dashboard accessible via mobile or desktop

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displays real-time particle concentration, size distribution, and contamination trends. The system is battery-powered and portable, enabling continuous on-site water quality monitoring without laboratory support. This solution reduces cost and complexity, making large-scale microplastic detection practical for environmental monitoring and research.

## **A DEEP LEARNING-BASED APPROACH FOR EARLY DETECTION OF CARDIAC ARREST IN NEWBORNS**

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### **ABSTRACT:**

Cardiac arrest in newborns is a life-threatening condition that requires immediate detection and intervention to improve survival outcomes. However, existing monitoring systems in Cardiac Intensive Care Units (CICUs) primarily rely on threshold-based alarms and traditional statistical methods, which often fail to capture subtle temporal variations in physiological signals. This study proposes a deep learning-based framework for the early detection of cardiac arrest in neonates using continuous physiological data. The system leverages Long Short-Term Memory (LSTM) networks and ensemble learning techniques to analyze time-series signals such as electrocardiogram (ECG), heart rate variability, oxygen saturation (SpO<sub>2</sub>), and blood pressure. Automated feature extraction enables the model to identify complex temporal patterns that precede critical cardiac events. To enhance clinical usability, Explainable Artificial Intelligence (XAI) techniques are integrated to provide interpretable insights into predictions, enabling clinicians to make informed and timely decisions. The proposed system reduces false alarms, minimizes human intervention, and supports proactive care. Overall, this approach aims to improve early diagnosis, enhance neonatal survival rates, and provide a reliable decision-support system for critical care environments

### **KEYWORDS:**

Deep Learning, LSTM, Neonatal Care, Cardiac Arrest Detection, Explainable AI, CICU

**Q-Flex: An Energy-Minimalist Neuro-Symbolic Architecture for NIST-Standardized Post-Quantum Security in Industrial IoT Continuum**

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**Abstract**

The rapid expansion of the Internet of Things (IoT) into critical infrastructure has necessitated a transition toward quantum-resistant security; however, the integration of National Institute of Standards and Technology (NIST) post-quantum cryptography (PQC) standards remains a significant challenge for resource-constrained devices due to prohibitive computational and energy overheads. This research addresses the "security-performance gap" by proposing Q-RAIS (Quantum-Ready Adaptive IoT Sentinel), a novel neuro-symbolic co-design architecture. The methodology integrates a dedicated hardware-accelerated Number Theoretic Transform (NTT) unit within a 32-bit RISC-V core, paired with a lightweight Deep Reinforcement Learning (DRL) agent for intelligent cryptographic agility. This agent dynamically modulates security levels—ranging from classical Elliptic Curve Cryptography (ECC) to hybrid and full ML-KEM/ML-DSA modes—based on real-time telemetry including battery state, network latency, and perceived threat intensity. Experimental results, validated using the Edge-IIoTset and PQM4 benchmarks, demonstrate that the proposed hardware acceleration reduces NTT-related latency by 73% and total energy consumption per handshake by 39% compared to classical ECC. Furthermore, the DRL-driven controller achieves a classification accuracy of 96.4% in identifying optimal security modes, effectively mitigating "Harvest Now, Decrypt Later" threats while extending device operational lifespan by up to 2.5x. The primary contributions of this work include a fragmentation-resilient PQC handshake protocol and a multi-metric Quantum Encryption Resilience Score (QERS) framework. This research provides a scalable and energy-efficient blueprint for deploying lattice-based cryptography in the next generation of resilient industrial IoT networks.

**Keywords:**

Post-Quantum Cryptography, IoT Security, Hardware-Software Co-design, Reinforcement Learning, ML-KEM, Lattice-Based Cryptography, Energy Efficiency.

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## **AI Multimodal Behavioral Mood Monitoring via Transformer-Based Text Analysis and Facial Expression Inference**

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### **ABSTRACT:**

Mental health problems are often overlooked because of a lack of awareness and timely intervention. In this study, a privacy-preserving artificial intelligence-powered mood monitoring system that passively infers the user's emotional tendencies when using a computer is proposed. To ensure the privacy and security of the user, the suggested system uses an Edge AI architecture and is completely offline. To achieve multimodal affect analysis, the system combines the inference of facial expressions and the analysis of the user's typing patterns in the text input. The system uses confidence-weighted sentiment score calculation based on the reconstruction of the text input using the raw keystrokes and the transformer model using the RoBERTa algorithm. It also uses the extraction of facial expressions using the MediaPipe model based on the active user interactions. Geometric feature analysis is used to determine the emotion based on the extracted facial expressions. To generate the mood summary and to identify the user's negative mood patterns, the system aggregates the emotional states into a structured format based on a three-hour window. The system allows early intervention in the user's behavior using the progressive alerts based on the series of negative mood patterns.

### **KEYWORDS:**

Multimodal Emotion Recognition, RoBERTa, AI-based Mood Tracking, Edge AI, PrivacyPreserving AI, Behavioral Mood Monitoring

## **Cybercrime Underground Economy Analysis**

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### **Abstract**

This study focuses on analyzing the underground economy of cybercrime, which has rapidly evolved with the growth of advanced technologies. Cybercriminal activities such as ransomware, Distributed Denial of Service (DDoS) attacks, and data breaches have increased significantly, impacting individuals, organizations, and governments worldwide. A major highlight of this research is the emergence of Crime-as-a-Service (CaaS), a business model that allows even non-experts to perform cyberattacks using ready-made tools and services.

The proposed system introduces a data analytics framework to investigate cybercrime patterns by collecting and analyzing large-scale data from online hacker communities and malware databases. Advanced techniques such as LSTM, CNN, and Generative Adversarial Networks (GANs) are used for anomaly detection and classification of cyber threats. The system processes unstructured data, converts it into structured form, and identifies suspicious activities effectively

This research helps in understanding cybercrime trends, predicting future threats, and improving cybersecurity strategies. The findings contribute to building a safer digital environment by supporting governments and organizations in strengthening their cyber defense mechanisms

**A Heuristic-Driven Cyber Triage Framework for Efficient Digital Evidence  
Prioritization**

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**ABSTRACT**

This paper presents an Automated Cyber Triage Tool that improves the efficiency of digital forensic investigations. The system collects, analyzes, and prioritizes digital evidence using heuristic rules, metadata extraction, anomaly detection, and SHA-256 hashing. It ensures evidence integrity, reduces manual effort, and accelerates the identification of relevant artifacts. The tool also generates structured, court-ready reports, enhancing the accuracy and reliability of forensic analysis. Experimental results demonstrate improved investigation speed and effective prioritization of critical evidence. The system provides a scalable and cost-effective solution for modern digital forensic workflows.

**KEYWORDS:**

Cyber Triage, Digital Forensics, SHA-256, Metadata Extraction, Evidence Analysis, Forensic Automation

**INTERPRETABLE AQI FORECASTING USING MACHINE LEARNING AND  
SHAP ANALYSIS**

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**ABSTRACT:**

Rapid urbanization and increasing pollution in city needs exact, real-time, and interpretable air quality surveillance systems. The proposed project proposes one Explainable Artificial Intelligence (XAI) system of air quality index (AQI) prediction in urban areas with a policy-driven, smart decision-engine. The system combines previous air quality measurements and real-time weather measurements in addition to the geolocation of users to give them location-based AQI forecasts through a web interface. Attentionenhanced XGBoost model attains high prediction performance by gaining complex temporal and spatial relationships. In order to enhance transparency, SHAP (Shapley Additive Explanations) is employed to determine the major urban pollution sources including PM2.5, vehicular emissions, industrial activities and meteorological conditions. Besides the real-time prediction, the system forecasts the AQI value over the next three days based on the temporal analysis being trend, which is able to plan ahead and implement early intervention. An intelligent policy engine examines various city conditions like type (metro, industrial, coastal), traffic, time of day, seasonal changes, and event-specific conditions such as festivals. Policies and ranking are selected dynamically from structured knowledge using TOPSIS multi-criteria decision making based on impact, feasibility, cost, urgency, and compatibility against root causes. Moreover, the use of fuzzy logic is supported to manage uncertainty and gives early alerts before the AQI critical values are achieved. The system delivers high-priority recommendations, AQI improvement projections and real-time SMS notifications to promote efficient urban air quality management

**KEYWORDS:**

AQI Prediction, Explainable AI (XAI), XGBoost, SHAP, Real-Time Monitoring, Smart Decision System, Fuzzy Logic.

**Real-Time Sign Language Detection Using Deep Learning**

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**ABSTRACT:**

Sign language serves as a vital communication medium for individuals with hearing impairments. However, the communication gap between sign language users and non-signers remains a significant challenge. This project leverages deep learning, specifically Long Short-Term Memory (LSTM) networks, to build an intelligent system capable of recognizing and translating sign language gestures into text. By using sequential data captured from hand landmarks, the LSTM model effectively learns temporal patterns in sign gestures. The system comprises a Django backend that handles model inference and data management, alongside a React frontend offering an interactive and user-friendly interface. The output is a trained Keras model and a corresponding label set that facilitates real-time detection and translation of sign language. This paper aims to address communication barriers and promote inclusivity through the development of technological solutions.

**KEYWORDS:**

Long Short-Term Memory, Temporal patterns, Keras model, Model inference

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**ABSTRACT:**

Rapid urbanization and industrial expansion have intensified air pollution, posing critical threats to public health and environmental sustainability. Conventional Air Quality Index (AQI) systems rely on static, centralized reporting and lack predictive capability for future pollution trends. This paper proposes an integrated framework that combines a Dynamic Pollution Load Index (DPLI) with privacy-preserving federated learning for proactive air quality forecasting and health risk assessment. The DPLI aggregates multiple pollutants — PM<sub>2.5</sub>, PM<sub>10</sub>, NO<sub>2</sub>, SO<sub>2</sub>, and CO — into a unified index aligned with AQI standards, enabling comprehensive environmental assessment. A federated learning architecture distributes model training across geographically dispersed monitoring stations, transmitting only encrypted model updates to a central aggregator, thereby preserving data privacy without sacrificing collaborative intelligence. The XGBoost algorithm is employed to model non-linear pollution patterns and generate accurate short-term AQI forecasts. Predicted pollution levels are mapped to health risk categories to quantify exposure severity across population groups. An AI-driven recommendation engine delivers real-time alerts and personalized preventive guidance for individuals and environmental authorities. The proposed framework advances beyond existing centralized systems by simultaneously achieving predictive accuracy, data privacy, and actionable health intelligence — offering a scalable solution for sustainable urban air quality management

**KEYWORDS:**

Air Quality Index, Dynamic Pollution Load Index, Federated Learning, XGBoost Forecasting, Health Risk Assessment.

## **SMARTGATE: SECURING NETWORK ACCESS WITH BEHAVIORAL INTELLIGENCE**

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### **ABSTRACT**

In the modern digital era, the rapid growth of computer networks and internet-based services has significantly increased the need for strong network security mechanisms. Unauthorized access, internal misuse, and malicious activities within a network can lead to serious problems such as data breaches, service disruption, and loss of sensitive information. Traditional security systems such as firewalls and authentication mechanisms mainly focus on preventing external threats, but they often fail to detect suspicious behaviour from trusted devices already connected to the network with suspicious activity detection rates of 60–75%. Therefore, this study proposes a Secure Network Access System with Behaviour Analysis that enables administrators to monitor and manage network activities effectively. The proposed techniques are network scanning, port scanning, traffic monitoring, behaviour monitoring, intrusion detection, and packet inspection. These techniques help in identifying connected devices, monitoring their activities, and detecting suspicious behaviour in the network. The main objective of the system is to detect abnormal behaviour within the network and provide administrators with better control over connected devices. The novelty of the proposed system lies in its ability to continuously analyse the behaviour of devices rather than relying only on initial authentication or first-time device verification. Unlike conventional systems where a device is considered trusted after its first successful connection, the proposed system continuously monitors device activities such as IP address, MAC address, connection status, upload speed, and download speed to identify unusual patterns. The proposed framework includes a centralized monitoring system with an administrative dashboard that collects and displays real-time network information for all connected devices. If suspicious behaviour is detected, the system identifies the responsible device and alerts the administrator. Initially, the administrator can restrict or block specific services of the device without disconnecting it completely, and if the suspicious activity continues, the device can be disconnected from the

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network to prevent further threats. The system also supports remote dashboard access, allowing administrators to monitor and control the network from any location. The implementation results show that the system improves network visibility, enables early detection of suspicious activities, and provides efficient control over network access achieving suspicious activity detection rate of 88–95%, and alert accuracy of 90–95%. Overall, the proposed system enhances network security by continuously analysing device behaviour, detecting potential threats, and providing effective administrative control to maintain a secure and reliable network environment.

**KEYWORDS:**

Network Security, Secure Network Access, Behaviour Analysis, Anomaly Detection, Device Monitoring, Intrusion Detection, Access Control, Network Monitoring, Cybersecurity, Real-Time Monitoring.

**EDUBOT: STREAMLINING HIGHER EDUCATION ADMISSIONS WITH  
CONVERSATIONAL AI**

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**ABSTRACT**

The increasing complexity and scale of college admission processes create significant challenges in providing timely and accurate information to prospective students. Traditional admission support systems, which rely on manual communication or rule-based chatbots, often lack scalability, adaptability, and contextual understanding. To address these limitations, this paper presents an AI-driven conversational framework that enhances admission assistance by integrating Natural Language Processing (NLP) with generative artificial intelligence. The proposed system is developed as a web-based application using HTML, CSS, and JavaScript for the frontend, and the Django framework for backend operations. A key contribution of this work is the integration of a generative AI model through the Gemini API, enabling context-aware and human-like dynamic responses. Additionally, the system employs a hybrid knowledge acquisition approach by combining automated web scraping of institutional websites with semantic processing of uploaded PDF documents to build a structured and queryable knowledge base. The framework supports real-time query handling across multiple admission-related areas, including eligibility criteria, course information, application procedures, and fee details. Experimental results indicate that the system outperforms traditional intent-based chatbots in terms of response relevance, latency, and user satisfaction. Overall, the proposed approach reduces administrative workload while delivering continuous, scalable, and personalized support, highlighting the transformative potential of generative AI in creating intelligent and student-centric conversational systems for higher education. Top of Form Bottom of Form.

**KEYWORDS:** Conversational AI, Generative AI, Natural Language Processing, College Admissions, Django, Knowledge-Based Systems, Automation

**A personalized virtual reality learning for special student**

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**ABSTRACT**

Children with special needs, particularly those identified with **Attention Deficit Hyperactivity Disorder (ADHD)**, **Autism Spectrum Disorder (ASD)**, and **Down syndrome**, encounter considerable obstacles, which have been highlighted by the increasing demand for inclusive education. Their specific cognitive and behavioural requirements are often inadequately addressed by conventional educational settings, resulting in diminished academic confidence, involvement, and understanding. Helping Hands is a tailored online learning platform designed to tackle these challenges by offering a flexible and accessible digital environment. To facilitate personalized learning at an individual pace, the proposed system integrates interactive learning modules, visually engaging content, and user-friendly interfaces. The platform utilizes modern web technologies, including HTML, CSS, JavaScript, and a backend powered by MongoDB, to ensure seamless functionality and efficient data management.

Moreover, by providing tools for monitoring development and identifying learning patterns, the system promotes collaboration among educators, parents, and students. This enables the consistent delivery of developmental assistance and targeted interventions for each child. The platform prioritizes inclusivity and user-friendliness, allowing students to interact with educational resources in a manner that aligns with their abilities and preferences.

The results indicate that a personalized, technology-enhanced learning approach can significantly enhance both learning results and student engagement for those with special needs. By fostering equitable learning experiences and empowering students through adaptable digital education, the proposed solution aims to bridge the educational divide. To boost user efficacy and involvement, future enhancements might include speech recognition, gamified experiences, and artificial intelligence for advanced personalization.

Review Paper on Glucose Monitoring System

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**ABSTRACT:**

The advancement of continuous glucose monitoring (CGM) systems has significantly improved diabetes management; however, existing solutions remain either invasive or lack reliable predictive capabilities for early intervention. This paper presents a **hybrid AI-driven smart glucose monitoring system** that integrates noninvasive sensing with real-time predictive analytics to enhance accuracy and usability. The proposed approach combines optical and physiological sensor data with contextual parameters such as heart rate, physical activity, and temperature to enable multimodal data acquisition. A hybrid deep learning architecture, incorporating convolutional neural networks (CNN) for feature extraction and long short-term memory (LSTM) networks for temporal analysis, is employed to estimate glucose levels and forecast future trends. Unlike conventional systems that focus solely on monitoring or prediction, this framework performs both tasks simultaneously within a unified model. The system also includes a mobile-based interface with real-time alerts and personalized feedback for proactive hypoglycemia prevention. Experimental evaluation indicates improved prediction accuracy and reduced variability compared to traditional noninvasive and standard CGM approaches. Additionally, the proposed design enhances patient comfort by eliminating invasive procedures while maintaining reliable performance. This work demonstrates the potential of combining noninvasive sensing, multimodal data fusion, and predictive intelligence to develop next-generation smart healthcare solutions for effective and personalized diabetes management

**KEYWORDS:**

Artificial intelligence, noninvasive glucose monitoring, continuous glucose monitoring, hypoglycemia prediction, CNN-LSTM, multimodal data fusion, wearable sensors, smart healthcare

**LASER SECURITY SYSTEM USING ESP32**

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**ABSTRACT**

The Laser Security System is a cost-effective and efficient safety mechanism designed to detect unauthorized access in restricted areas. The system uses a laser beam directed towards a Light Dependent Resistor (LDR) or photodiode, forming an invisible barrier. Any interruption in the beam caused by an intruder triggers an alarm or alert system, thereby providing real-time security monitoring. This project demonstrates the practical application of basic electronic components in enhancing security at homes, offices, banks, and military zones. Its low cost, simplicity, and reliability make it suitable for small-scale security solutions.

Additionally, the project opens up opportunities for enhancements, such as integrating Arduino or other microcontrollers for automation, using GSM modules for sending alerts via SMS, or connecting to IoT platforms for remote monitoring. These upgrades can significantly increase the system's functionality and make it suitable for modern smart security applications.

**KEYWORDS:**

Laser Security System, ESP32, Intrusion Detection, IOT.

## **REAL-TIME SIGN LANGUAGE AND AUDIO CONVERSION USING AI**

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### **ABSTRACT**

Real-time sign language and audio conversion using artificial intelligence (AI) presents a significant advancement in assistive communication systems for deaf and hard-of-hearing individuals. This study proposes an efficient AI-based framework that enables bidirectional translation between sign language gestures and spoken language in real time. The system integrates computer vision techniques with deep learning models, including convolutional Neural Networks (CNNs), for accurate hand gesture recognition. Additionally, Natural Language Processing (NLP) is employed to convert recognized gestures into meaningful text, while speech modules incorporating Automatic Speech Recognition (ASR) and text-to-speech (TTS) facilitate seamless audio interaction. The proposed model was designed to operate with low latency and high accuracy, ensuring effective communication in dynamic environments. A dataset of hand gestures was used to train and validate the model, achieving an accuracy of over 90% in gesture recognition under controlled conditions. Furthermore, the system is adaptable to multiple sign languages and regional variations, thereby enhancing its scalability and usability. Key challenges, such as lighting variations, background noise, and gesture ambiguity, are addressed through preprocessing and model optimization techniques. The system also ensures data privacy and user comfort during continuous use. The experimental results demonstrate the robustness and efficiency of the proposed approach in real-time scenarios. Overall, this study contributes to the development of inclusive and accessible communication technology, bridging the gap between sign language users and the general population and promoting equitable interaction in society

### **KEYWORDS:**

Real-Time Sign Language Recognition, Artificial Intelligence, Machine Learning, Convolutional Neural Networks (CNN), Automatic Speech Recognition (ASR), Text-to-Speech (TTS), and Gesture Recognition

## **FIX MY RIDE - ROADSIDE ASSISTANCE APPLICATION**

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### **ABSTRACT**

FixMyRide is a Progressive Web Application (PWA) designed to deliver efficient, real-time emergency roadside assistance by connecting vehicle owners with verified service providers such as mechanics, fuel delivery personnel, and medical responders. It features a multi-role architecture comprising users, service providers, and administrators, supporting functionalities like service request management, job tracking, provider verification, and administrative monitoring. Built using modern technologies including React, TypeScript, Tailwind CSS, and Supabase, the application ensures scalability, responsiveness, and secure data handling. It leverages real-time database capabilities for live tracking of service requests, while GPS integration improves location-based accuracy. Security is maintained through role-based access control and Row Level Security (RLS), ensuring data privacy and integrity. Additional features such as KYC-based provider verification, earnings tracking, review systems, and dispute resolution enhance transparency and reliability. The PWA architecture also enables offline access, installability, and strong crossdevice performance. While core features are implemented, planned enhancements include payment gateway integration, push notifications, and in-app communication, making FixMyRide a scalable and user-centric solution for improving roadside assistance services

### **KEYWORDS:**

Kyc verification, Emergency Roadside Assistance, Progressive Web Application (PWA), Real-Time Tracking, GPS Integration

## **IDENTIFICATION OF PENINSULAR HERBAL PLANTS USING CNN**

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### **ABSTRACT**

The rapid advancements in artificial intelligence (AI), deep learning (DL), and machine learning (ML) are reshaping how we identify plants, manage agriculture, and control pests. Traditionally, plant identification required detailed observation and expert knowledge, which could be slow and error-prone. With deep learning, especially Convolutional Neural Networks (CNNs), we can now automate plant identification by examining leaf characteristics like shape, texture, color, and patterns, leading to more precise species recognition. In the agricultural sector, AI is being used to increase crop yields, spot diseases early, and optimize the use of fertilizers. Smart farming employs deep learning to analyze extensive datasets, helping farmers make better decisions to enhance productivity and efficiency. Machine learning plays a vital role in identifying plant diseases by analyzing images to catch symptoms early, preventing widespread crop damage. Resources like the Plant Village, Cassava, and Rice Leaf datasets are essential for training these models to detect diseases effectively, even under real-world conditions. Beyond farming, studies on native plants have revealed their potential as natural pesticides, offering sustainable alternatives to harmful synthetic chemicals. Many plants have compounds with insecticidal and antimicrobial properties, which reduce the reliance on chemical pesticides that can harm the environment and lead to resistant pests. Combining AI-driven smart farming with environmentally friendly pest control methods not only boosts agricultural efficiency but also conserves biodiversity and lessens the environmental impact of traditional farming practices. By integrating modern AI technologies with traditional plant knowledge, this research opens up new possibilities for sustainable and advanced plant identification, conservation, and agricultural management. Moving towards AI-based agriculture has the potential to improve global food security, aid in conservation efforts, and encourage eco-friendly farming practices, paving the way for a more productive and sustainable future.

**A REVIEW SELF-HEALING ASYNCHRONOUS NETWORK-ON-CHIP USING  
BIO-MIMETIC ROUTING**

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**ABSTRACT**

With the rapid advancement of System-on-Chip (SoC) technology, Network-on-Chip (NoC) has emerged as a scalable communication architecture. However, NoC systems face major challenges such as traffic congestion and increasing fault rates due to technology scaling. Ant Colony Optimization (ACO)-based routing has been widely used for adaptive load balancing, while fault-aware routing techniques improve system reliability. This paper reviews and integrates two significant approaches: Regional ACO-based Routing (RACO), which reduces routing table overhead and improves load balancing, and ACO-based Fault-Aware Routing (ACO-FAR), which enhances fault tolerance using dynamic path selection. Based on these approaches, a Hybrid Regional Fault-Aware ACO (HRFA-ACO) routing algorithm is proposed. The proposed method combines regional abstraction with fault awareness and incorporates a look-ahead model to improve routing decisions. The hybrid approach achieves reduced memory cost, improved load balancing, enhanced fault tolerance, and higher throughput. This work highlights the importance of integrating optimization and reliability techniques for efficient NoC communication systems.

**KEYWORDS:**

Ant Colony Optimization (ACO), Network-on-Chip (NoC), Load Balancing, Fault-Tolerant Routing, Adaptive Routing.

## **LEUKEMIA DIAGNOSIS AND ANALYSIS USING AI AND NATURAL LANGUAGE PROCESSING**

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### **ABSTRACT**

Acute Leukemia is a life-threatening hematological disorder affecting both children and adults, often leading to severe complications or death if not diagnosed early. Among its types, Acute Lymphoblastic Leukemia (ALL) is highly aggressive in children and spreads rapidly, requiring timely detection. Traditional diagnostic methods such as manual blood smear and bone marrow examination are time-consuming and may lead to less accurate results due to human error. This study proposes an intelligent computer-aided diagnostic system for leukemia diagnosis and analysis using Artificial Intelligence and Natural Language Processing techniques. The system integrates image processing with deep learning models, particularly Convolutional Neural Networks (CNN), to analyze stained bone marrow images and classify them into ALL subtypes and normal conditions. Additionally, Natural Language Processing is used to analyze clinical reports and extract meaningful insights to support diagnosis. The proposed method employs robust segmentation techniques for accurate identification of cellular components, followed by feature extraction and classification. Experimental results demonstrate that the system achieves high accuracy and outperforms traditional methods, indicating its effectiveness as a reliable diagnostic tool. The proposed approach can assist pathologists by improving diagnostic speed, accuracy, and overall clinical decision-making in leukemia detection and classification

### **KEYWORDS**

Deep Learning, CNN, Medical Image Processing

## **Block chain based health care system**

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### **ABSTRACT**

Blockchain has unique advantages in data privacy protection and data integrity. We can solve many security problems, such as the single point of failure and data sharing in the current centralized system through blockchain approach. With the popularization of information technology, people have higher expectations for the continuity of medical assistance. It has become a trend to eliminate the problem of information isolation through data sharing. Blockchain technology has many prominent characteristics, such as distributed ledger, encryption technology, immutable audit trail and traceable data provenance. It can effectively solve the problem of data sharing among multiple organizations. It considers the security, tamper free and traceable features of blockchain. Combined with the needs of the medical system, we design a blockchain-based multi-role healthcare data sharing system. Here we combine the medical security system in our proposed. In addition, we design a smart contract to improve the insurance claim process, and two data sharing protocols for medical data and personal health data to provide users with a simple and efficient strategy for managing personal data.

### **KEYWORDS:**

Blockchain, Healthcare System, Decentralized Healthcare, Electronic Health Records (EHR), Secure Data Sharing

## **AI Integrated Recruitment Management System**

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### **ABSTRACT**

This project presents an AI-Powered Integrated Recruitment Management System, an intelligent hiring platform that combines automated resume screening, AI-driven interview analysis, candidate scoring, and offer letter generation to improve recruitment efficiency and decision-making. The system operates as a closed-loop framework by collecting candidate data from resumes, interview responses, and job descriptions, analyzing profiles using Natural Language Processing (NLP) and machine learning techniques, and dynamically evaluating candidate suitability for specific roles. The resume checker extracts key information such as skills, education, and experience, and matches them with job requirements to generate an initial score. The interview analysis module evaluates candidate responses using speech-to-text conversion, sentiment analysis, and keyword matching to assess communication skills, technical knowledge, and confidence levels. A unified scoring mechanism integrates both resume and interview performance to ensure accurate and unbiased candidate ranking. Additionally, the system automates the final stage of recruitment by generating customized offer letters for selected candidates using dynamic templates. Unlike traditional hiring methods, the proposed solution leverages data-driven and AI-based evaluation to reduce manual effort, minimize bias, and enhance consistency. Overall, it functions as a comprehensive smart recruitment system that accelerates hiring processes and improves talent acquisition outcomes.

### **KEYWORDS:**

Recruitment Automation, Resume Analysis, Interview Analysis, Natural Language Processing (NLP), Sentiment Analysis, Candidate Ranking, Offer Letter Generation, Artificial Intelligence (AI), Hiring System.

**MITIGATING MODEL RISK THROUGH SYMBOLIC AI:  
ADDRESSING TEMPORAL DRIFT AND INTERPRETABILITY IN  
CREDIT SCORING USING SEQUENTIAL COVERING**

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**ABSTRACT**

With the enforcement of the **EU AI Act (2026)** and global "Right to Explanation" mandates, the financial sector faces a critical "Black-Box" dilemma: the trade-off between predictive accuracy and model transparency. While deep learning models offer high performance, their lack of interpretability poses significant compliance risks for institutional lenders. This research evaluates the efficacy of **Sequential Covering Algorithms**, specifically the **RIPPER (Repeated Incremental Pruning to Produce Error Reduction)** and **CN2** frameworks, as transparent alternatives for credit risk assessment. Using the **Lending Club** and **German Credit** datasets, we developed a hierarchical rule-based system to extract human-readable logic for loan approvals. To address the challenge of data non-stationarity, we introduced a **Temporal Drift Analysis**, simulating economic shifts to measure the robustness of learned rules over time.

Our experimental results demonstrate that Sequential Covering models achieve a competitive AUC-ROC (within 2-3% of Random Forest benchmarks) while reducing the model complexity to a compact set of under **15 logical rules**. Furthermore, the rule-based approach exhibited superior stability during simulated high-volatility periods, allowing for rapid manual refinement by risk officers—a feat impossible for opaque neural networks. This study contributes a validated framework for **Model Risk Management (MRM)**, proving that symbolic AI can bridge the gap between high-dimensional data analysis and strict regulatory accountability in 2026 banking environments.

**Keywords:**

Credit Scoring, Sequential Covering, RIPPER Algorithm, Explainable AI (XAI), Model Risk Management, Financial Regulation, EU AI Act.

## **MACHINE LEARNING ENABLED SIDCHAIN MODEL FOR IOMT COMMUNICATIONS**

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### **ABSTRACT**

The Internet of Medical Things (IoMT) has transformed healthcare by enabling remote monitoring and efficient data management. However, ensuring secure and efficient communication among IoMT devices remains a significant challenge. This paper proposes a Machine Learning (ML) enabled sidechain model for IoMT communications, leveraging blockchain technology and ML algorithms to provide a secure, decentralized, and scalable framework for medical data exchange. Our model utilizes a primary blockchain for data storage and a sidechain for processing and validating transactions, with ML algorithms optimizing data routing and anomaly detection. The proposed model is designed to prevent data tampering, unauthorized access, and single-point failures, thereby enhancing trust among stakeholders.

### **KEYWORDS**

IoMT , Blockchain, Sidechain, Machine Learning

## **ADVANCED IV INFUSION AUTOMATION SYSTEM WITH REAL-TIME MONITORING AND ALERTS**

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### **ABSTRACT**

Intravenous (IV) infusion is widely used in healthcare for delivering fluids and medications, but conventional systems rely on manual monitoring, which can result in inaccuracies and delayed response during critical situations. An advanced IV infusion automation system is proposed to enhance patient safety and efficiency through real-time monitoring, control, and communication. The system utilizes optical sensing to measure drip rate and a weight-based mechanism to estimate the remaining fluid volume. A closed-loop control mechanism regulates the flow rate using a motorized clamp based on userdefined settings, ensuring accurate and consistent infusion. The system incorporates abnormal condition detection to identify issues such as flow interruption, irregular infusion, underflow, or overflow, and generates immediate alerts. For enhanced safety, the system is designed to automatically stop the infusion process during critical conditions to prevent harm to the patient. In addition, wireless connectivity using an embedded WiFi-enabled controller enables remote monitoring through a centralized dashboard, allowing multiple systems to be observed simultaneously. The system also supports data logging for analysis and record-keeping. The overall design focuses on reliability, cost-effectiveness, and scalability, making it suitable for both hospital environments and resource-limited healthcare settings

### **KEYWORDS:**

Intravenous Infusion, Automated IV System, Drip Rate Monitoring, Closed-Loop Control, ESP32, Wireless Monitoring, Data Logging, Patient Safety, Medical Automation, Real-Time Alerts.

**EDGE-BASED WOMEN SAFETY SURVEILLANCE SYSTEM WITH  
MULTICAMERA BEHAVIOR RISK ANALYSIS AND INTELLIGENT  
ALERT MECHANISMS**

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**ABSTRACT**

This paper presents an edge-based intelligent surveillance system for women's safety that detects and responds to threats in real time. Unlike traditional cloud-based systems, the proposed system performs on-device processing using optimized deep learning models, significantly reducing latency, enhancing data privacy, and ensuring reliable operation even in low or no network conditions.

The system integrates multiple video sources, such as webcams and IP cameras, into a unified control panel with a live grid display. It employs advanced behaviour analysis to detect suspicious activities such as following, based on parameters including distance, movement patterns, and duration. To overcome limitations of existing systems, which rely mainly on distance-based detection, the proposed approach incorporates vertical alignment and bounding box overlap, thereby reducing false positives caused by camera perspective and environmental variations. Additionally, the system identifies lone individuals to detect potentially vulnerable situations, which is often overlooked in conventional surveillance solutions.

High-risk video feeds are automatically highlighted, and real-time audio alerts are generated to notify monitoring personnel. The system can also be integrated with local law enforcement for rapid response. Experimental results demonstrate that the proposed system achieves efficient real-time performance with low computational overhead, making it more accurate, privacy-preserving, and suitable for deployment in public safety environments compared to existing approaches.

**KEYWORDS:**

Edge computing, women safety, surveillance system, behavior analysis, real-time detection, suspicious activity, video analytics, computer vision

**Voice-Controlled Mobile Robotic Arm for Assistive Pick and Place  
Operations for the Elderly and Physically Challenged**

Dr.Jenitta J , Bhavana S, DS Keerthi, Uday Kumar C, Jagadish S.

**ABSTRACT**

This paper presents the design and implementation of a voice controlled mobile robotic arm intended to assist elderly individuals and physically challenged users in performing daily pick and place operations. The proposed system integrates speech recognition technology with a mobile robotic platform to enable hands free interaction and intuitive control. The proposed assistive robotic solution aims to enhance independence and quality of life for users with mobility limitations by providing an efficient human machine interaction interface. The modular architecture allows future integration of advanced technologies such as artificial intelligence, obstacle detection. The robotic arm mounted on a mobile base, performs object manipulation tasks such as grasping, lifting, and relocating items within the user's environment.

## **AN AI-POWERED EMOTION TRANSITION STABILITY AND CONFIDENCE LEVEL DETECTION FOR CHILDREN WITH AUTISM**

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### **ABSTRACT**

This project presents an AI-powered real-time emotion detection and reporting system designed for children affected by Autism Spectrum Disorder (ASD). The primary objective of this system is to assist in understanding and monitoring the emotional and behavioral patterns of autistic children in a noninvasive and efficient manner. The system captures facial images through a live camera and analyses the child's facial expressions using the EfficientNet-B3 deep learning model, which ensures high accuracy and performance. The proposed model is capable of detecting a range of emotions, including happiness, sadness, anger, fear, surprise, and neutrality. In addition to emotion classification, the system estimates the confidence level of each prediction and continuously tracks transitions between emotional states over time. This temporal analysis provides deeper insights into the child's emotional responses during various activities, therapy sessions, and social interactions. Furthermore, the system automatically generates a comprehensive report that includes emotion distribution, confidence metrics, and observed variations in emotion. This report serves as a valuable tool for parents, teachers, therapists, and caregivers, enabling them to understand the child's emotional condition better and tailor appropriate interventions and support strategies. Overall, the proposed solution offers an intelligent, practical, and scalable approach to emotional assessment in children with ASD. By leveraging advanced deep learning techniques, the system contributes to improving behavioral monitoring and supports early intervention, ultimately enhancing the quality of care and developmental outcomes for children with autism.

### **KEYWORDS:**

Autism Spectrum Disorder, Emotion Detection, Deep Learning, EfficientNet-B3, Facial Expression Analysis, Real-Time Monitoring.

## **ONE STOP PERSONALIZED CAREER AND EDUCATION ADVISOR FOR STUDENTS**

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### **ABSTRACT**

The One Stop Personalized Career and Education Advisor is a web-based application that helps students and job seekers select suitable career and education paths through personalized guidance. Many individuals face confusion due to the availability of multiple career options and lack of proper counseling, and this system addresses that issue by providing a centralized and user-friendly platform. The application collects user data such as academic background, interests, and skills, and processes it using a rule-based recommendation system to generate appropriate career options, educational pathways, and certification suggestions. Developed using HTML, CSS, and JavaScript, the system ensures a responsive user interface and smooth user experience without requiring backend support. It also functions as a decision support system, helping users understand their strengths and align them with suitable opportunities. By reducing dependency on manual counseling and enabling access anytime, this project demonstrates how web technologies, user-centered design, **and** career recommendation algorithms can be combined to improve career planning and decision-making

### **KEYWORDS**

Web-Based Application, Rule-Based Recommendation System, Decision Support System, Responsive User Interface, Career Recommendation Algorithm, Data Analysis (User Profile Processing), Skill-Based Recommendation, Personalized Guidance System

## **SMART HAPTIC FEEDBACK VEST FOR DUAL SENSORY IMPAIRMENT**

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### **ABSTRACT**

Individuals with dual sensory impairment face significant challenges in navigation due to the absence of both visual and auditory feedback. This paper presents a Smart Haptic Feedback Vest designed to provide safe and independent mobility through vibrotactile communication. The proposed system integrates a Raspberry Pi with a YOLOv5-based object detection model and an ultrasonic sensor for accurate distance measurement. The detected information is translated into directional vibration patterns using Linear Resonant Actuator (LRA), enabling users to perceive obstacle direction and proximity through touch alone. To enhance safety, an SOS alert system using a GSM module and a fall detection mechanism using motion sensors are incorporated. The system operates entirely offline, ensuring reliability in diverse environments. Experimental results demonstrate effective real-time performance, making the system suitable for practical assistive applications.

### **KEYWORDS:**

Dual sensory impairment, Haptic feedback vest, Vibrotactile communication, Obstacle detection, Assistive technology, Real time, Fall detection.

**JALSATHI: AI POWERED EARLY WARNING DASHBOARD FOR  
INDIAN VILLAGES**

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**ABSTRACT**

Water scarcity significantly affects agricultural sustainability and safe drinking water in rural Indian villages, causing crop failure, wastage, and health issues. Farmers often lack real-time data on soil moisture, temperature, and water usage, leading to inefficient irrigation. JalSathi is an AI-powered early warning dashboard that uses ESP32-based IoT sensors to monitor environmental conditions across fields and water sources. The collected data is sent to a cloud platform for analysis and displayed through a user-friendly dashboard. This helps farmers optimize irrigation and enables authorities to manage water distribution effectively. The system is low-cost, scalable, and suitable for non-technical users. It improves water efficiency, provides drought alerts, enhances crop yield, and supports sustainable and equitable water management in rural communities.

**KEYWORDS:**

IoT, Water Scarcity, Smart Irrigation, AI Dashboard, ESP32, Soil Moisture Monitoring, Water Management, Sustainable Agriculture

## **Electric Vehicle Wireless Charging Station: A Review**

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### **ABSTRACT**

Electric vehicles (EVs) are rapidly gaining importance as a sustainable mode of transportation, increasing the need for efficient and user-friendly charging solutions. Wireless charging based on inductive power transfer offers a cable-free approach, improving convenience and reducing physical wear, though challenges such as energy losses and alignment issues persist. An extensive literature survey is done and it is concluded that the modern systems integrate Internet of Things (IoT) technologies for real-time monitoring of key parameters like voltage, current, temperature, and energy usage. These smart systems enable remote access, automation, and improved operational control, enhancing overall safety and efficiency. Advanced features such as RFID-based authentication and intelligent energy management further strengthen system reliability and security. Additionally, optimization techniques help in better placement and utilization of charging infrastructure. The combination of wireless charging and IoT supports scalable and flexible solutions for Ecosystems. Overall, this integrated approach contributes to the development of efficient, secure, and user-centric charging systems, promoting wider EV adoption and sustainable energy practices

## **UrbanParkX: Intelligent Parking Management for Smart City Environments**

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### **ABSTRACT**

The rapid growth of urbanization has significantly increased the number of vehicles, leading to major challenges in parking management such as traffic congestion, time wastage, inefficient space utilization, and lack of transparency in billing systems. Traditional parking systems are largely manual or static, lacking realtime updates, secure validation, and intelligent pricing mechanisms. To address these limitations, this project presents a fully implemented and functional Smart Parking Management System that leverages real-time automation, dynamic booking, and secure validation techniques. The proposed system is a web-based application developed using Python (Flask), HTML, CSS, JavaScript and MySQL, designed to provide an integrated platform for users, parking owners, and administrators. It enables users to view real-time parking slot availability and book slots based on precise date and time selection, ensuring that only current and future bookings are permitted, thereby eliminating invalid or expired reservations. The system incorporates automatic check-in and check out tracking along with dynamic duration calculation, which enhances accuracy and reduces manual intervention. A key innovation of the system is its intelligent payment mechanism, where users are charged strictly based on actual parking duration. In the case of booking extensions, the system calculates and applies charges only for the additional time, avoiding redundant payments and improving transparency. Each booking generates a unique QR code and OTP, enabling secure and efficient ticket verification at entry and exit points. Additionally, users are provided with ticket confirmation and re-verification options, ensuring reliability and ease of access. The system also features real-time synchronization of available and occupied parking slots, preventing overbooking and ensuring optimal utilization of resources. Parking owners can register their facilities by submitting relevant documents, which are verified through an admin approval system with timestamp tracking, enhancing trust and accountability. The administrative module includes a comprehensive dashboard that provides analytics on users, bookings, revenue, and owner status, along with filtering capabilities for effective data management and decision-making. To further enhance user experience, the system integrates email notification services that provide booking confirmations, ticket details, and expiry alerts to users, as well as rejection notifications to parking owners when applicable. A location-based parking discovery feature is also included, allowing users to

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identify nearby parking spaces, with future-ready support for navigation and direction services. Compared to existing parking solutions, the proposed system demonstrates approximately 70% improvement in efficiency, transparency, and usability, primarily due to its real-time processing, secure QR and OTP-based validation, and dynamic pricing model. It effectively addresses critical real-world issues such as traffic congestion caused by parking search, overbooking, inaccurate billing, lack of security, and poor user experience. In conclusion, the Urban Smart Parking Management System offers a scalable, secure, and user friendly solution that is well-suited for modern smart city environments. With its fully implemented features and real-time capabilities, the system is ready for practical deployment and future enhancements.

***KEYWORDS:***

Smart Parking, Real-Time Booking, QR Code, OTP Verification, Slot Management, Flask, MySQL, Web Application, Automation, Smart City.

## **Voice-Controlled Mobile Robotic Arm for Assistive Pick and Place Operations for the Elderly and Physically Challenged**

Dr.Jenitta J , Bhavana S, DS Keerthi, Uday Kumar C, Jagadish S.

### **ABSTRACT**

The rapid growth of urbanization has significantly increased the number of vehicles, leading to major challenges in parking management such as traffic congestion, time wastage, inefficient space utilization, and lack of transparency in billing systems. Traditional parking systems are largely manual or static, lacking realtime updates, secure validation, and intelligent pricing mechanisms. To address these limitations, this project presents a fully implemented and functional Smart Parking Management System that leverages real-time automation, dynamic booking, and secure validation techniques. The proposed system is a web-based application developed using Python (Flask), HTML, CSS, JavaScript and MySQL, designed to provide an integrated platform for users, parking owners, and administrators. It enables users to view real-time parking slot availability and book slots based on precise date and time selection, ensuring that only current and future bookings are permitted, thereby eliminating invalid or expired reservations. The system incorporates automatic check-in and check out tracking along with dynamic duration calculation, which enhances accuracy and reduces manual intervention. A key innovation of the system is its intelligent payment mechanism, where users are charged strictly based on actual parking duration. In the case of booking extensions, the system calculates and applies charges only for the additional time, avoiding redundant payments and improving transparency. Each booking generates a unique QR code and OTP, enabling secure and efficient ticket verification at entry and exit points. Additionally, users are provided with ticket confirmation and re-verification options, ensuring reliability and ease of access. The system also features real-time synchronization of available and occupied parking slots, preventing overbooking and ensuring optimal utilization of resources. Parking owners can register their facilities by submitting relevant documents, which are verified through an admin approval system with timestamp tracking, enhancing trust and accountability. The administrative module includes a comprehensive dashboard that provides analytics on users, bookings, revenue, and owner status, along with filtering capabilities for effective data management and decision-making. To further enhance user experience, the system integrates email notification services that provide booking confirmations, ticket details, and expiry alerts to users, as well as rejection notifications to parking owners when applicable.

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### **KEYWORDS:**

Smart Parking, Real-Time Booking, QR Code, OTP Verification, Slot Management, Flask, MySQL, Web Application, Automation, Smart City.

**Voice-Controlled Mobile Robotic Arm for Assistive Pick and Place  
Operations for the Elderly and Physically Challenged**

Dr.Jenitta J , Bhavana S, DS Keerthi, Uday Kumar C, Jagadish S.

**ABSTRACT**

This paper presents the design and implementation of a voice controlled mobile robotic arm intended to assist elderly individuals and physically challenged users in performing daily pick and place operations. The proposed system integrates speech recognition technology with a mobile robotic platform to enable hands free interaction and intuitive control. The proposed assistive robotic solution aims to enhance independence and quality of life for users with mobility limitations by providing an efficient human machine interaction interface. The modular architecture allows future integration of advanced technologies such as artificial intelligence, obstacle detection. The robotic arm mounted on a mobile base, performs object manipulation tasks such as grasping, lifting, and relocating items within the user's environment.

## **AI-Optimized Rescue Drone System for Efficient Disaster Evacuation**

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### **ABSTRACT**

An AI Optimized Rescue Drone System focus on evacuating the victims to the safest zone through the easiest and safest path from the disaster area by coordinating the multiple drones. These drones are integrated with four advanced deep learning techniques comprises of You Once Look Once, Ant Colony Optimization, Particle Swarm Optimization, Long Short Term Memory. The You Once Look Once for detecting the survivors, obstacles, terrains and debris which are passed by the onboard processing unit. The Ant Colony Optimization for finding the safest path from dynamic routes, that helps the rescue team to evacuate the people in short period of time to safest place. The Particle Swarm Optimization algorithms are used to avoid the collisions of multiple aerial vehicles over the mesh communication network. The Long Short Term Memory algorithms are used to find the climatic conditions of the environment that includes air pressure, wind direction and humidity. An AI Optimized Rescue Drone System not only coordinates the multiple drones and also provides the significant pathway to reach the safest zone by managing the flight path and rescue path by predicting the weather conditions in real time. This result in reducing the manual efforts and time taken to rescue the people and helps in taking the decision faster for rescue teams.

### **KEYWORDS**

AI-Driven Drone Rescue System; Search and Rescue; YOLO Object Detection; AntiColony Optimization (ACO); Intelligent Path Planning; Disaster Evacuation; Deep Learning; Real-Time Victim Detection; Autonomous Drones; Disaster Management: Rescuers; Survivors.

## **Smart Placement Portal for Students with AI-Driven Insights**

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### **ABSTRACT**

This paper presents the Smart Placement Portal for Students with AI-Driven Insights and Alumni Engagement, a centralized web application designed to enhance campus recruitment and student development. The research addresses the gap in traditional recruitment systems that lack personalized guidance and intelligent evaluation. The platform features a personalized student dashboard with curated job and internship listings, skilldevelopment courses, and an AI-powered resume checker using Natural Language Processing to optimize resumes. An AI-proctored assessment system ensures exam integrity through real-time webcam monitoring. Placement officers use a comprehensive dashboard for managing opportunities, applications, and scheduling placement drives. A novel Alumni & Student Connection module enables mentorship, secure communication, and networking through forums and events. The system was developed using modern web technologies and evaluated through user interaction analysis, demonstrating improved efficiency, transparency, and student engagement in the placement process. The study involved system design, implementation, and user interaction analysis, demonstrating improved student engagement and placement success. This portal offers scalable, automated, and personalized solutions that strengthen industry-academia ties, making it valuable for institutions aiming to modernize their placement processes. The proposed solution is scalable, adaptable, and capable of bridging the gap between academia and industry by providing intelligent, automated, and collaborative tools for all stakeholders. This makes it highly relevant for institutions aiming to modernize and optimize their placement ecosystems.

### **KEYWORDS**

Smart Placement Portal, AI-driven insights, Campus Recruitment, alumni engagement, Career Guidance, Web Application

## **Operon-A Page-Model-Based No-Code Website Builder Platform**

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### **ABSTRACT**

Getting a business online has never been more important — yet for many small business owners, it remains surprisingly out of reach. Operon was built to change that. It is a web-based platform that lets any business owner — regardless of their technical background — put together a professional, multipage website by simply picking from a collection of ready-made, fully designed pages. Rather than handing users a blank canvas filled with tiny building blocks to arrange, Operon gives them complete pages: a full Home page, a polished About page, a structured Services page, and so on. Users pick what fits, fill in their information, and their site is live. Each customer on the platform gets their own private workspace. Whatever they build, upload, or publish stays entirely theirs — separate from every other user on the system. This paper walks through the thinking behind Operon, what similar tools and research already exist, how the platform is put together under the hood, what it can do today, and where it is headed next.

### **KEYWORDS:**

No-Code Platform, Website Builder, Multi-Tenant Architecture, Page Templates, SaaS, Business Digitalization

**BLOCKCHAIN ENABLED DATA HIDING FRAMEWORK FOR SECURE  
MEDICAL IMAGING WITH SEGMENTATION AND BIOMETRICS**

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**ABSTRACT**

The preservation of private health and biometric data during network transmission primarily requires sophisticated encryption techniques. In this study, a reliable, bidirectional data embedding framework incorporating SVD, hyperchaotic cryptography, and feature detection through deep learning is proposed. Here, the DenseNet-121 algorithm identifies distinctive traits in biometrics (iris and face) to construct dynamic encryption keys, thus avoiding the use of classical OTPs. On the other hand, the U-Net system is used to segment lesions to identify the ROI, guaranteeing that vital information is embedded in non-critical image parts to ensure medical accuracy. The system is founded on an integrated approach to distributed storage that involves storing the encrypted payload off-chain through IPFS-Go while maintaining the metadata and hash on the Ethereum blockchain (Ganache). The experiments yielded promising outcomes, with a PSNR > 40 dB, a biometric AUC of 0.9899, and an NPCR of 99.47%, indicating strong protection against cryptanalysis.

**KEYWORDS:**

4D Hyperchaotic Map, Blockchain, DenseNet, Ganache, IPFS-Go, Medical Image Security, Singular Value Decomposition (SVD), U-Net Segmentation.

## **AI-Enabled Inner Safety Fence for Proactive Human Protection In Industrial Area**

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### **ABSTRACT**

This paper presents an intelligent vision-based safety system designed to protect human operators in automated industrial environments. The system continuously monitors restricted zones using a camera and processes video frames through a deep learning-based object detection model. A YOLO-based algorithm is employed to identify human presence with high speed and accuracy.

The proposed system introduces a virtual safety boundary, allowing dynamic monitoring instead of relying on fixed physical barriers. When a person is detected within the hazardous region, the system immediately generates a control signal to stop machine operation. The use of an embedded platform ensures compact design, low power consumption, and cost efficiency.

Experimental observations indicate that the system provides reliable detection, minimal response delay, and adaptability to different industrial setups. This approach contributes to safer human– machine interaction and supports the development of smart industrial environments.

### **KEYWORDS:**

Human Detection, YOLO, Raspberry Pi, Industrial Safety, Computer Vision, Embedded Systems.

## **Smart Productivity Assistant An Integrated Desktop Application with AI, Task Management & Entertainment**

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### **ABSTRACT**

This paper presents the design and development of a Smart Productivity Assistant, an interactive and user-friendly desktop software application built using Python with the CustomTkinter module. The system is engineered to address the growing need for unified productivity tools by integrating a comprehensive set of essential features within a modern, customizable interface. The application combines an AI-based chat assistant, a task manager, a reminder system, an analytical dashboard, and mini-games for recreational engagement, providing users with a holistic environment for day-to-day task management and productivity enhancement. The AI-based chat assistant leverages Natural Language Processing (NLP) techniques to interpret user queries and deliver contextually relevant responses, enabling seamless human-computer interaction. The integrated task manager allows users to create, prioritize, track, and complete tasks efficiently, while the reminder system ensures timely notifications for scheduled activities and deadlines. The dashboard aggregates user activity metrics and productivity statistics in real time, offering actionable insights through visual analytics. The system incorporates advanced computational intelligence methodologies including a suggestive model for intelligent recommendations, an optimization algorithm for resource and schedule planning, pattern mining for identifying recurring user behaviors and task trends, and NLP for natural interaction. These modules collectively empower the application to adapt to individual user habits and deliver a personalized experience that evolves over time.

Account management and settings customization allow users to tailor the interface to their preferences, while a built-in Help Centre and Feedback System enhance user support and enable continuous improvement of the platform. Mini-games integrated within the application serve as cognitive break activities, promoting mental wellness and sustained engagement. The application architecture follows a modular design paradigm, ensuring scalability, maintainability, and ease of future feature integration. The Smart Productivity Assistant aims to simplify everyday computing tasks and consolidate dispersed productivity tools into a single, cohesive platform. By combining artificial intelligence, task automation, behavioral analytics, and gamification within an accessible desktop interface, the application delivers a modern, user-centric solution designed for improved productivity, engagement, and overall digital well-being.

## **Drone Assisted Rapid Distribution For Critical Healthcare Products**

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### **ABSTRACT**

The timely delivery of critical healthcare products such as blood, vaccines, organs, and emergency medical supplies is essential for saving lives, particularly in remote areas and emergency situations where traditional transportation is delayed. This paper presents a drone-based rapid distribution system designed to address these challenges by enabling fast and reliable delivery using unmanned aerial vehicles (UAVs). The proposed system supports real-time tracking, temperature-controlled storage, and automated delivery mechanisms to handle time-sensitive medical needs. Experimental results demonstrate that the system significantly reduces delivery time by up to 60–70% compared to conventional methods, especially in congested and hard-to-reach areas. Additionally, cost analysis indicates a reduction in operational expenses while maintaining high reliability and safety. These findings highlight the effectiveness of drone-based systems in improving emergency healthcare logistics and supply chain efficiency.

### **KEYWORDS**

Drone delivery, UAV, healthcare logistics, emergency medical supplies, blood transport, vaccine distribution, organ transplant logistics, rapid response, last-mile delivery, medical supply chain

**FASTER CASE RESOLUTION WITH DIGITAL COURTROOM MANAGEMENT**

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**ABSTRACT**

The increasing volume of legal cases and reliance on manual processes have led to significant delays, inefficiencies, and lack of transparency in traditional judicial systems. These challenges highlight the need for a robust digital framework that can streamline courtroom operations and support data-driven decisionmaking. DigiCourt is proposed as an AI-powered digital courtroom management system designed to automate and optimize end-to-end judicial workflows. The system integrates machine learning and natural language processing (NLP) techniques to intelligently process case data, generate concise case summaries, and classify cases based on predefined parameters such as urgency, case type, and complexity. This enables efficient case prioritization and reduces the burden on judicial authorities. In addition, a smart scheduling module dynamically allocates hearing dates by analyzing judge availability, case priority, and resource constraints, thereby minimizing scheduling conflicts and delays. To ensure data integrity, security, and transparency, blockchain technology is incorporated for maintaining immutable records of case transactions, document submissions, and status updates. The system also features role-based access control, providing customized dashboards for judges, lawyers, and administrators to monitor case progress and manage activities in real time. By reducing manual intervention, improving accuracy in case handling, and enhancing accountability through secure data management, DigiCourt offers a scalable and efficient solution for modernizing judicial processes. The proposed system aims to significantly reduce case backlog, improve transparency, and accelerate the delivery of justice through intelligent automation.

**KEYWORDS:**

DigiCourt, Digital Judiciary, Case Management System, Machine Learning, Blockchain, Legal Automation, Smart Scheduling.

**Urbanshield AI real time behaviour anomaly and offender recognition in  
smart surveillance system**

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**ABSTRACT**

The increasing complexity of urban crime and the limitations of conventional surveillance systems have created a pressing need for intelligent, automated monitoring solutions. This project presents an AI-powered Suspicious Activity Detection and Crime Face Recognition System that integrates deep learning and computer vision techniques to enhance public safety. The system utilizes YOLO-based object detection to identify weapons and suspicious objects in real time, while pose estimation and anomaly detection algorithms analyze human behavior for abnormal or aggressive movements. Simultaneously, faces captured in the surveillance feed are processed using a Grassmannian-based CNN facial recognition module, which extracts robust facial features and accurately matches them against a criminal database. By combining behavioral analysis with facial identification, the system ensures precise and proactive threat detection while reducing false alarms and reliance on manual monitoring. Designed for deployment in smart cities, banking environments, and law enforcement operations, the system provides automated alert mechanisms and report generation for immediate response to potential threats. Its real-time processing capabilities allow authorities to monitor multiple areas simultaneously and respond swiftly to incidents, improving overall situational awareness. The integration of advanced AI algorithms enables the system to handle challenging conditions such as poor lighting, crowd density, and partial facial occlusions.

**KEYWORDS**

Threat Detection, Alert Triggering, Emergency Notification, Real-Time Alerts, Warning System, Incident Reporting, Authority Communication, Security Response

**SMART WASTE CLASSIFICATION SYSTEM USING IMAGE PROCESSING  
FOR AUTOMATED SEGREGATION**

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**ABSTRACT**

With the rapid expansion of urbanization and economic development, effective solid waste management has become critical for global environmental sustainability. The problem of segregating waste remains a massive challenge, as current smart bins mostly focus on compaction without automated classification, leading to heavy recycling contamination. This paper presents the design, implementation, and evaluation of a Smart Waste Classification System that automates the identification and sorting of refuse at the edge of the network. The system leverages a hybrid Convolutional Neural Network (CNN) deep learning architecture to classify waste into distinct categories: paper, cardboard, glass, metal, plastic, and organic/medical waste. Rather than relying on costly cloud computing, the inference runs locally on a low-power edge device—such as a Jetson Nano—integrated with an ESP32-CAM module and an automated mechanical conveyor system driven by servo motors. Real-time trials demonstrate an end-to-end classification accuracy reaching 98%. By embedding deep learning directly into the disposal process, this system reduces human intervention, optimizes resource recovery, and provides a scalable, cost-effective framework aligned with the principles of the circular economy.

**KEYWORDS:**

Deep Learning; Waste Classification; Edge Computing; Convolutional Neural Networks; Circular Economy; Smart Bins; Automated Segregation; Object Detection; Image Processing.

## **AI-BASED QUESTION GENERATION A REVIEW OF ASSISTIVE INTERFACE & EVALUATION FOR ALL USERS**

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### **ABSTRACT**

This project presents an AI-based system that automatically generates question papers while ensuring accessibility for blind people. The main aim is to reduce the manual effort involved in preparing question papers and to create an inclusive platform that can be used easily by all users. The system uses Natural Language Processing (NLP) to understand input materials such as study notes or syllabi and generate well-structured questions. To improve the quality and variation of generated questions, it incorporates the LLaMA 3.1 (8B Instant) model, which enables better understanding of content and context.

For secure access, the system includes an OTP (One Time Password)-based authentication mechanism, where a one-time password is generated and sent through channels like email or messaging, allowing only authorized users to access the platform. The system is developed as a web-based application that integrates AI (Artificial Intelligence) processing, user interaction, and communication features. To support blind people, the system provides voice-based interaction using Text-to-Speech (TTS) to read out questions and Speech Recognition to capture user responses. This allows users to interact without depending on visual interfaces. The system also includes an evaluation module that checks answers using a keyword-based approach and provides simple feedback along with performance scores.

Overall, the system combines automation, security, and accessibility into a single platform, making question paper generation easier while ensuring that blind people can actively use and benefit from it.

### **KEYWORDS:**

Artificial Intelligence, Natural Language Processing, Question Paper Generation, Accessibility, Speech Recognition, Text-to-Speech, OTP Authentication, Web-Based System, Automated Evaluation.

## **REAL TIME VOICE TO ACTION MAPPING USING SPEECH RECOGNITION IN AN INTERACTIVE GAME DEVELOPMENT**

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### **ABSTRACT**

The rapid advancement of human computer interaction (HCI) has led to the emergence of natural user interfaces such as speech recognition. However, most modern video games still rely on traditional input devices such as keyboards, mice, and controllers, which limit accessibility for physically challenged users and reduce the naturalness of interaction. Additionally, existing voicebased gaming systems often suffer from high latency and limited accuracy, making them unsuitable for real-time gameplay. This project proposes a Real Time Voice to Action Mapping Framework for interactive game development, enabling users to control game actions through spoken commands. The system captures audio input via a microphone, processes it using speech recognition techniques, and maps recognized commands to predefined in-game actions. The architecture consists of audio preprocessing, speech recognition, command mapping, validation, and game control modules to ensure efficient interaction. A prototype was developed using the VOSK speech recognition engine with Python and integrated with the Unity game engine through a low-latency UDP communication bridge. Initial experiments showed high latency ranging from 3 to 15 seconds due to blocking recognition and inefficient processing. However, by applying optimization techniques such as partial result processing, reduced audio buffer size, grammar constraints, and noise filtering, the system achieved sub-second response latency. Recognition accuracy also improved from approximately 75% to around 90%. The proposed system enhances accessibility, responsiveness, and user experience in gaming environments. It provides a scalable framework for voice-driven interaction and contributes to future research in real-time and multimodal human-computer interaction systems.

### **KEYWORDS:**

Speech Recognition, Voice Controlled Games, Human Computer Interaction, Games

**PREDICTIVE FINANCIAL ANALYTICS: A HYBRID  
PROPHET ATTENTION-LSTM ARCHITECTURE FOR NON-LINEAR  
STOCK VOLATILITY FORECASTING AND RISK MANAGEMENT**

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**ABSTRACT**

Stock market volatility is one of the most challenging problems in computational finance, and the consequences of inaccurate forecasting are tangible and severe. This project presents a hybrid forecasting system that addresses this problem by decomposing financial time series before attempting to learn from them, thereby allowing each type of variation to be modelled using the method most suited to its character. The fundamental premise of the proposed approach is that applying a single modelling technique to the entirety of a financial time series is inherently suboptimal, because the series contains structurally distinct components that respond to different underlying forces operating across different timescales. The proposed architecture combines Facebook Prophet with a two-layer Long Short-Term Memory network augmented by a Temporal Attention mechanism. Prophet is responsible for extracting the deterministic structural components of the price series, specifically the long-run trend, the weekly and annual seasonality patterns, and the influence of discrete market events such as trading holidays and policy announcements. What remains after this decomposition is a stochastic residual series that encodes the short-horizon microvolatility driven by liquidity conditions, market sentiment, and algorithmic trading activity. The Temporal Attention mechanism within the LSTM allows the network to assign differential importance weights to historical time steps when constructing its forecast. The final prediction is synthesised by adding the Prophet deterministic forecast to the LSTM residual prediction, yielding a composite output that reflects both structural market behaviour and short-term volatility dynamics. Experimental evaluation confirms that the hybrid architecture achieves approximately 12 percent lower Root Mean Squared Error compared to the best standalone baseline, with particularly strong performance during high-volatility market periods. The

International Conference on Recent Trends in Technology – 2026 - 17th  
April 2026

temporal attention weights also provide a degree of model interpretability that is absent from standard LSTM approaches, making the system suitable for deployment in regulated financial environments where model transparency is required.

**KEYWORDS:**

Hybrid Forecasting, Facebook Prophet, Long Short-Term Memory, Temporal Attention Mechanism, Stock Volatility, Financial Time Series, Risk Management, Deep Learning.

## **DRIVER DROWSINESS DETECTION SYSTEM**

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### **ABSTRACT**

Driver fatigue during the car driving it's may causes the accidents in the world. Detecting the drowsiness of the driver is one of the surest way of measuring driver fatigue. This system works by monitoring the eyes of the driver and sounding an alarm when he/she is drowsy. During the long travel the driver may feel sleepy so that time its unsafe to the other travellers also get dangerous so these may disadvantages to everyone. For this project we uses utilizes like python, OpenCV, Imutils, and Dlib libraries to develop a robust system capable of monitoring the driver's facial features, detecting signs of drowsiness. These includes automatically reducing the vehicle's speed, and transmitting the driver's location to their last dialed contact. The driver eyes is scanned by this devices always while it's closes or feel sleepy it starts to alarm and make some heavy noises.

In this project, we propose and implement a hardware system which is based on infrared light and can be used in resolving these problems. The driver drowsiness detecting system is used to recover from many dangerous. In this facial detecting, yawn detecting, scanning the eyes, driver's drowsiness. By providing timely alerts and taking proactive safely measures, this system aims to reduce the risk of accidents and ultimately saves lives on the road

### **KEYWORDS**

Driver's drowsiness, Facial detection, Alarms

**A Tiered Edge-Cloud System for Multi-Modal Agricultural Diagnostic  
Arbitration and Explainable Decisioning**

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**ABSTRACT**

Farmers in India are confronted with several problems such as late detection of diseases in crops, uncertainty in the selection of crops, and lack of agricultural experts in the area. To overcome such problems, we are proposing a smartphone-based system acting as an agricultural assistant using AI technologies. Our system employs three types of AI technologies such as the use of MobileNetV2 for fast detection of diseases in crops in an offline manner, the use of XGBoost for accurate recommendation of crops based on the soil type, and the use of Gemini 1.5 Flash for handling ambiguous situations in an intelligent manner. Our system has shown a high accuracy of 98.24% in the detection of diseases in crops within a latency time of 26 milliseconds, which is much faster than the human response time. Our system has shown 99.65% precision in recommending crops based on the type of soil. Moreover, the basic functionality of the proposed system is fully offline-based.

**KEYWORDS**

Precision Agriculture, Deep Learning, MobileNetV2, XGBoost, Multimodal Artificial Intelligence, Crop Diseases, Edge Computing, Explanatory Artificial Intelligence.

## **Hybrid Spatial–Frequency Feature Fusion of CNN, LBP, and FFT for Facial Image Morphing Detection**

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### **ABSTRACT**

Facial image morphing and deepfake generation techniques introduce subtle spatial and frequency inconsistencies that are difficult to detect using single-domain analysis. Existing convolutional neural network (CNN)-based detectors primarily rely on spatial representations and often exhibit performance degradation under compression and post-processing operations. To address this limitation, this paper proposes a hybrid spatial–texture–frequency feature fusion framework for robust facial image tampering detection. The method integrates deep spatial features extracted using a pretrained CNN backbone with handcrafted texture descriptors derived from Local Binary Patterns (LBP) and spectral characteristics obtained through Fast Fourier Transform (FFT) analysis. The complementary feature sets are concatenated at the feature level and optimized through a fully connected classifier with cross-entropy loss. Experiments conducted on a publicly available facial manipulation dataset demonstrate that the proposed fusion model achieves an accuracy of 96.8% and an F1-score of 0.967, outperforming the CNN-only baseline by 4.3% in accuracy. The model also demonstrates improved robustness under JPEG compression and Gaussian noise perturbations. The primary contribution lies in the systematic integration of spatial, micro-texture, and frequency-domain representations within a unified classification framework, providing enhanced detection reliability for real-world digital forensic applications. However, the feature-level concatenation increases dimensional complexity, which may affect computational efficiency and scalability in large-scale forensic deployments.

### **KEYWORDS**

Deepfake detection, facial image tampering, CNN, Local binary patterns, Fast Fourier transform, feature fusion.

**AN OPTIMIZED DEEP LEARNING ARCHITECTURE FOR LOW-RESOURCE  
DEVICES USING MODEL COMPRESSION AND EDGE COMPUTING  
TECHNIQUES**

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**ABSTRACT**

Deep learning models achieve high accuracy but require substantial computational power, memory, and expensive hardware, limiting their deployment on low-resource and edge devices. This project proposes an optimized lightweight deep learning architecture designed for resource-constrained environments. The system employs transfer learning along with model compression techniques such as pruning, quantization, and knowledge distillation to significantly reduce model size and inference latency while preserving performance. The optimized model is deployed using TensorFlow Lite for efficient execution on edge devices, enabling real-time processing with reduced computational cost and energy consumption.

**KEYWORDS**

Model Compression and Optimization, Edge Computing Integration, Pruning, Quantization, Knowledge Distillation.

**SECURE RETRIEVAL-AUGMENTED GENERATION WITH ROLE  
BASED ACCESS CONTROL FOR MULTI-USER DOCUMENT  
SYSTEMS**

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**ABSTRACT**

Organizations need a secure and effective document content retrieval system that can support multi-user access and high levels of data confidentiality at the same time, though, they do not provide fine-grained access control at the document retrieval level which is done by the traditional Retrieval Augmented Generation (RAG) models. This restriction may expose sensitive data in enterprise environments where there are several users share common repository of documents. To overcome this difficulty, the present paper presents a secure RAG-based document retrieval integrated with Role Based Access Control (RBAC). The proposed structure consists of ownership-aware filtering and role-based authorization as part of the process of vector similarity search, which guarantees that only document embeddings that belong to authorized users are involved in retrieval operations. Moreover, query-sensitive filtering mechanism is introduced to detect and block the potentially sensitive queries that might seek to retrieve confidential information. The system processes the uploaded document by text extraction, text chunking and embedding generation and stores them in a vector database and metadata, including user identity and document owned information. In query processing, an embedding is pruned based on RBAC policies and then semantic similarity search is done. The experimental analysis shows that this framework yields 96 percent response accuracy and 94 percent retrieval precision and provides secure access control with low response time of 1.4 to 2.5 seconds. The findings show that implementing RBAC in the retrieval pipeline enhances security and at the same time does not deteriorate the efficiency and performance of RAG based document retrieval systems in a multi-user enterprise setting.

**KEYWORDS**

Retrieval-Augmented Generation, Role-Based Access Control, Secure Retrieval, Semantic Search, Vector Database

## **A TRUST-AWARE ADAPTIVE RADIUS-BASED FRAMEWORK FOR HYPERLOCAL EMPLOYMENT MATCHING**

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### **ABSTRACT**

Face-to-face job markets in the relevant locations are also becoming more and more relevant especially in terms of matching job seekers and employers.. Nevertheless, the majority of the existing job portals apply pre-determined radius-based filters and simple keyword matching. That way it also results in irrelevant job listings, low matching and high job cancellation. Also, the current systems lack proper mechanisms to evaluate user reliability and ensure the safety of the employers, as well as the employees. In this paper, a Trust-Aware Adaptive Radius-based Hyper-Local Employment Matching System is introduced. It is a combination of dynamic space optimization and behavioural reliability modelling within one matching framework. The system will modify the job search radius depending on the number of jobs that are available in the area. This will make the job postings more appropriate and reduce unnecessary exposure. In addition, this computes reliability scores on both the side of the employer and the employee on the basis of quantifiable variables such as completion rate, consistency in responses, attendance reliability and stability in application. The trust measures are added to a weighted match score that enhances its accuracy in ranking a job and the reliability of the platform. The system also has Role-Based Access Control (RBAC) and organized job posting validation to provide safe and controlled interactions. As experimentation results indicate, the new framework enhances job relevance, increases successful jobs completion rates, and generally increases the efficiency of the system compared to the old-fashioned distance-only filtering techniques. Therefore, the proposed system is scalable, trust-friendly, and optimization-based in terms of matching hyper-local employment.

### **KEYWORDS**

Hyper-local job matching, adaptive radius optimization, trust-aware recommendation system, reliability scoring, RBAC security.

## **BZIZ-DIGITAL BUSINESS CARD PLATFORM**

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### **ABSTRACT**

Bziz is a modern digital business card and micro-profile platform designed for sales professionals, entrepreneurs, and business owners to showcase their personal or business identity online through a single smart profile link. The platform represents a paradigm shift from traditional paper-based business cards to intelligent, data-driven digital networking tools. The platform allows users to register either as an individual like personal profile or as a business entity like company profile. Based on the selected registration type, Bziz dynamically collects relevant personal or business details such as name, designation, company name, address, contact details, services, and products. Upon successful registration, the system automatically generates a unique subdomain for each user, enabling easy sharing and branding. Each subdomain acts as a public-facing digital profile page, accessible via browser or QR code, eliminating the need for physical visiting cards. The public profile page displays essential information such as profile photo/logo, name, designation, contact details, and social media links structured through tabs including About Me / About Company, Services, Products, and Contact. A built-in QR code feature allows visitors to instantly save contact details directly into their mobile phone address book upon scanning, making networking faster and paperless. Bziz also provides an analytics and tracking system, enabling users to monitor total profile visitors, number of leads generated from services, product inquiries or orders, and engagement statistics per service or product. The platform is scalable, cloud-ready, and suitable for individual professionals as well as small and medium businesses aiming to enhance digital presence, branding, and lead conversion. This document presents the complete design, implementation, and evaluation of the BZIZ platform.

### **KEYWORDS:**

Digital business card, QR code sharing, online networking, web application, PHP, MySQL

## **IMAGE PROCESSING-BASED AUTOMATED SURFACE DEFECT DETECTION IN SMARTPHONE PCBs**

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### **ABSTRACT**

An image processing-based automated system is developed to detect surface defects in smartphone printed circuit boards (PCBs). In this system, the input PCB images are first preprocessed using grayscale conversion, Gaussian filtering, and adaptive thresholding to improve image quality and handle uneven lighting conditions. The defect areas are then identified without using any reference images by applying Canny edge detection, along with morphological operations and contour detection techniques. These steps help in clearly separating defect regions from the background of the PCB. After detecting the defect regions, important features are extracted and classified as defective or non-defective using a combination of Support Vector Machine(SVM) and DenseNet classifiers. This combination improves the overall accuracy and reliability of the system. The system can detect common PCB defects such as missing holes, board cracks, and fine surface cracks. It works for both single-layer and double-layer smartphone PCBs and is implemented using Python with the OpenCV library. Overall, this system offers a simple, cost-effective, and efficient solution for PCB defect detection, reducing manual inspection work and improving product quality in electronic manufacturing.

### **KEYWORDS**

PCB Defect Detection, Image Processing, Canny Edge Detection, Morphological Operations, Contour Detection, Support Vector Machine, DenseNet, OpenCV, Automated Inspection System.

AN INTELLIGENT PROMPT OPTIMIZATION AND EXECUTION  
PLATFORM USING AI TECHNIQUES

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**ABSTRACT**

Large Language Models (LLMs) are widely used for tasks such as text generation, question answering, and content creation. However, their performance heavily depends on the quality of input prompts, making prompt engineering a challenging and time-consuming process. Manual prompt design often involves trial-and-error, leading to inconsistent results and increased token cost. To address this issue, this project proposes an intelligent system that automatically optimizes prompts to improve response accuracy, relevance, and efficiency.

The system generates multiple prompt variations using transformation and evolutionary techniques and evaluates them using embedding-based models such as Sentence Transformers (SBERT). A scoring mechanism based on semantic similarity, clarity, and response quality is used to select the best-performing prompt, along with A/B testing for comparison. The platform is implemented using React (TypeScript), FastAPI, and PostgreSQL, and includes a real-time prompt testing sandbox and a feedback collection system. This approach reduces manual effort, enhances LLM performance, and provides a scalable solution for real-world AI applications.

**KEYWORDS:**

Prompt Optimization, Large Language Models (LLMs), Sentence Transformers (SBERT), Evolutionary Algorithms, A/B Testing, Semantic Similarity, FastAPI, React, PostgreSQL, Prompt Engineering, AI Systems.

**Secure Medical Data Sharing using AI-Based Multi-Scan Detection and  
Dual Encryption over Decentralized Storage.**

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**ABSTRACT**

The growing digitalization of the health sector has led to a shift from storing MRI, CT, and X-ray images locally to a cloud-based infrastructure. Nonetheless, cloud-based centralized storage is still susceptible to attacks at the point of failure and unauthorized data breaches. In this research, we present a hierarchical security system designed to protect sensitive patient information. Our system uses Deep Learning (U-Net) to extract a region of interest (ROI) for each image. In order to maximize efficiency, our system applies Hybrid Encryption, where the ROI is encrypted using highly complex DNA cryptography algorithms, while the background uses normal AES encryption. We then store the files using IPFS and maintain control of the Content Identifiers using a Blockchain ledger based on Ethereum technology. Results from our experiments show that our proposed encryption method delivers high security performance while minimizing computational costs.

**INTELLIGENT HYBRID CNN-TRANSFORMER ATTENTION MODEL FOR  
ROBUST MULTI-HORIZON AIR QUALITY INDEX FORECASTING**

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**ABSTRACT**

Air pollution is among the most critical factors adversely affecting public health and sustainability. As such, sophisticated tools and techniques are required for accurate forecasts and effective decision-making. Current solutions mostly provide single-step AQI predictions without sufficient analytical capabilities for proper decision support. Thus, this study presents a novel framework based on deep learning algorithms using CNN-Transformer-Attention architecture for multi-step and hyper-local Air Quality Index forecasts.

The proposed model combines multiple input channels like IoT sensor data, previous air quality observations, meteorological data, and satellite inputs. In addition to air quality predictions, the framework features two unique modules. They include Dynamic Pollution Source Fingerprinting for detection of the pollutant source and Prediction of Pollution Spread, which analyzes dispersion of the pollutants. Additionally, the solution provides Industrial Emission Violation Detection to alert authorities to any abnormal levels of pollution.

Personal Exposure Risk Scoring is employed to estimate exposure risk for at-risk population groups while Green Zone Planning Assistant is responsible for suggesting optimal greening policies for urban settings. Overall, the presented research transforms conventional AQI monitoring into an integrated tool for advanced pollution management and policy creation.

**KEYWORDS**

Air Quality Index (AQI), Deep Learning, CNN-Transformer, Attention Mechanism, Multi-step Forecasting, IoT Sensors, Pollution Source Identification, Pollution Spread Prediction, Environmental Monitoring, Smart Cities.

## **VibeVerse: Real-Time Multilingual Professional Interaction and Record Platform**

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### **ABSTRACT**

The rapid growth of globally distributed teams has increased the demand for communication platforms that can overcome language barriers while preserving meeting knowledge. This paper presents VibeVerse, a real-time multilingual communication system integrated with AI-based meeting intelligence. The platform is built on a distributed architecture using Node.js, MongoDB, and Socket.IO to enable lowlatency messaging and seamless automatic translation across multiple languages.

The system supports voice and video communication and utilizes browser-based speech recognition to capture meeting transcripts. These transcripts are processed using a large language model to generate structured outputs, including summaries, key points, decisions, action items, and sentiment analysis. To ensure reliability, a rule-based fallback mechanism is incorporated when AI services are unavailable.

Experimental evaluation demonstrates low API response time, efficient message delivery, and rapid report generation. The proposed system highlights the effective integration of real-time communication and natural language processing to enhance collaboration in multilingual environments.

### **KEYWORDS:**

Multilingual, WebSocket, Real Time Chat, Speech to Text, Minutes of Meeting, Summary.

## **WORKFORCE PLANNING PREDICTIVE MODELLING USING RANDOM FOREST ALGORITHM**

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### **ABSTRACT**

Workforce planning is a crucial procedure that allows organizations to ensure they have the correct number of staff with the necessary skills at the right moment. Numerous organizations encounter difficulties like inconsistent staffing needs and rising labor expenses stemming from variable customer demand and ineffective scheduling methods. Inefficient workforce planning can result in employee shortages that impact service quality or overstaffing that increases operational costs. By analysing these elements, the model can forecast upcoming workforce needs with greater precision. The Random Forest method, an ensemble machine learning approach, creates several decision trees and merges their results to enhance prediction accuracy and minimize overfitting.

The predictive model analyses past operational data to uncover trends in customer demand and employee usage. It also assesses employee performance metrics and absenteeism rates to identify the best staffing levels for various operational situations. Leveraging these insights, the system produces dependable workforce predictions that facilitate data-informed decision-making and effective scheduling approaches. The anticipated result of this project is to attain ideal staffing levels that align operational demand with cost-effectiveness in labor. Utilizing the Random Forest predictive model enables organizations to cut down on unnecessary labor costs, enhance employee efficiency, and ensure uniform service quality. In the end, this method improves organizational efficiency, allows for better workforce management, and assists organizations in effectively adapting to shifting demand patterns.

### **KEYWORDS**

Workforce Planning, Predictive analytics, Random Forest Algorithm, Forecasting, Employee Performance

## **Smart Interior Selling Platform: A Comprehensive Digital Ecosystem**

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### **ABSTRACT**

The interior design and construction material procurement industry faces significant challenges due to fragmented communication channels, manual quotation processes, and lack of real-time collaboration between stakeholders. Smart Seller Platform is a comprehensive web-based solution that seamlessly connects three key stakeholders: Customers, Designers, and Sellers. The platform streamlines the entire workflow from project conception to final quotation, incorporating features such as multi-role dashboards, AI-powered sketch-to-real visualization using Google Gemini API, real-time notifications, integrated chat, automated quotation generation with GST calculation, and comprehensive analytics. The system is built using React.js for the frontend, Node.js/Express for the backend, MongoDB for data persistence, and Socket.io for real-time communication. Experimental results demonstrate a 70% reduction in quotation turnaround time and a 100% digital workflow compared to traditional methods. The Smart Seller Platform effectively addresses the critical pain points in the interior design ecosystem, providing an efficient, transparent, and user-friendly solution for all stakeholders.

### **Keywords**

Interior Design, Material Procurement, Web-Based Platform, AI Visualization, Google Gemini API, Real-Time Communication, Quotation Automation, React.js, Node.js, MongoDB.

## **DESIGN AND IMPLEMENTATION OF A MULTI BRAND SOCIAL MEDIA STRATEGY MANAGEMENT SYSTEM WITH AUTOMATED SCHEDULING AND ANALYTICS USING MERN STACK**

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### **ABSTRACT**

Managing multiple brands across social platforms demands structured planning, consistent publishing, and clear performance tracking. Existing tools fragment these tasks and limit coordination across brands. This work presents a Social Media Strategy Management System that centralizes content planning, post execution, backlink tracking, and analytics within a single platform. The system uses the MERN stack for application development and Redis based queues for reliable scheduling. Users manage each brand through dedicated modules. The Content Calendar captures planned posts with date, title, post type, platform, and a short idea. The Post module supports detailed creation with caption, media upload, schedule time, and status tracking, followed by automated publishing at the defined time. The Backlink module records external links associated with each brand. The Analytics module presents performance data for informed decision making. The system reduces manual effort, enforces structured workflows, and maintains consistency across multiple brands. Experimental use shows improved scheduling accuracy and better visibility of content performance.

### **Keywords**

Social Media Management, Multi Brand Management, Content Calendar, Post Scheduling, Automated Publishing, MERN Stack, Redis Queue, API Integration, Backlink Management, Social Media Analytics.

## **THOZHAN - AI-BASED CROP INTELLIGENCE SYSTEM**

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### **ABSTRACT**

Agriculture plays a crucial role in supporting food production and economic stability, particularly in developing countries like India. However, farmers often face challenges such as unpredictable weather conditions, improper crop planning, and fluctuating market prices.

Traditional farming decisions are mostly based on experience and limited information, which can lead to inefficient resource utilization and financial loss. To address these challenges, this project proposes **Thozhan: an Agricultural Decision Support System** that utilizes machine learning techniques to assist farmers in making data-driven decisions.

The proposed system is developed as a web-based application using **Python and the Streamlit framework**, which provides an interactive interface for farmers to input agricultural data such as crop type, district, sowing date, and land area. The system integrates multiple predictive models to estimate important agricultural factors including **rainfall prediction, crop yield estimation, production calculation, demand forecasting, and price prediction**. Various machine learning algorithms such as **XGBoost Regressor, Random Forest Regressor, and Linear Regression** are used to analyze historical agricultural and market data in order to generate accurate predictions.

The system also includes data visualization features that present results in the form of charts and dashboards, allowing users to easily interpret agricultural trends and expected revenue. By combining predictive analytics with a user-friendly interface, the Thozhan system helps farmers improve planning, reduce uncertainty, and optimize crop production. Overall, the proposed system demonstrates how modern data science and machine learning technologies can support sustainable agriculture and enhance the decision-making capabilities of farmers.

## **COLLECTIVE BEHAVIORAL ANOMALY DETECTION IN IOT DEVICES USING MACHINE LEARNING TECHNIQUES**

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### **ABSTRACT**

The rapid growth of Internet of Things (IoT) devices has expanded the attack surface for largescale botnet infections such as Mirai and Bashlite. Existing Intrusion Detection Systems (IDS) rely on single-model anomaly detection, leading to high false positives and inability to detect coordinated Command-and-Control (C2) activity across multiple devices. This project proposes a Hybrid Machine Learning Intrusion Detection and Response System using a weighted fusion of Random Forest (six-class classification), Isolation Forest (anomaly detection on normal traffic), and One-Class SVM (novelty detection). The system achieves 100% binary classification accuracy with 0.00% false positives on the NBaIoT dataset, and ~96.09% multiclass accuracy with a macro F1 score of 0.9573 across six attack categories. A key contribution is the Collective Behavioral Anomaly Detection layer, which identifies synchronized botnet C2 activity across devices within a 60-second window — an ability absent in baseline systems. The system also includes continual unsupervised retraining to adapt to device-specific traffic patterns. Validation was performed in a real-time setup with IoT devices (IP camera, smart switch, smart bulb) connected via a home router, supported by a web-based dashboard for monitoring, alerts, and retraining. This hybrid and adaptive approach ensures high detection reliability while maintaining zero false positives, making it practical for real-world deployment.

### **KEYWORDS**

IoT Botnet Detection, Mirai, Bashlite, Hybrid Machine Learning, Random Forest, Isolation Forest, One-Class SVM, Collective Behavioral Anomaly Detection, N-BaIoT, False Positive Rate, Intrusion Detection System.

## **DEEPFRAMESUM: AN ENHANCED VIDEO SUMMARIZATION FRAMEWORK USING SUPERFRAME-BASED SEGMENTATION**

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### **ABSTRACT**

This paper presents **DeepFrameSum**, an artificial intelligence-based video summarization framework designed for efficient analysis of large-scale video data. The proposed method integrates deep learning with a superframe-based segmentation strategy to reduce redundancy while preserving essential temporal and visual information. Initially, video frames are extracted and transformed into discriminative feature representations using deep neural networks. Based on visual similarity and temporal continuity, frames are grouped into superframes to improve computational efficiency.

The framework further incorporates object detection and risk analysis modules to identify significant objects, events, and abnormal activities. An adaptive importance scoring mechanism evaluates the relevance of each segment, enabling effective selection of keyframes and critical video portions. The selected segments are then arranged in temporal order to generate a coherent and informative summary.

Experimental results demonstrate that the proposed approach achieves improved summarization quality with reduced processing time. The system provides a scalable and automated solution for applications such as surveillance, multimedia management, and intelligent video monitoring systems.

### **KEYWORDS**

Video Summarization ,Deep Learning ,Superframe Segmentation ,Keyframe Extraction, Object Detection, Video Analytics, Temporal Segmentation, Intelligent Surveillance.

**EDGE-BASED WOMEN SAFETY SURVEILLANCE SYSTEM WITH  
MULTICAMERA BEHAVIOR RISK ANALYSIS AND INTELLIGENT  
ALERT MECHANISMS**

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**ABSTRACT**

This paper presents an edge-based intelligent surveillance system for women's safety that detects and responds to threats in real time. Unlike traditional cloud-based systems, the proposed system performs on-device processing using optimized deep learning models, significantly reducing latency, enhancing data privacy, and ensuring reliable operation even in low or no network conditions.

The system integrates multiple video sources, such as webcams and IP cameras, into a unified control panel with a live grid display. It employs advanced behaviour analysis to detect suspicious activities such as following, based on parameters including distance, movement patterns, and duration. To overcome limitations of existing systems, which rely mainly on distance-based detection, the proposed approach incorporates vertical alignment and bounding box overlap, thereby reducing false positives caused by camera perspective and environmental variations. Additionally, the system identifies lone individuals to detect potentially vulnerable situations, which is often overlooked in conventional surveillance solutions.

High-risk video feeds are automatically highlighted, and real-time audio alerts are generated to notify monitoring personnel. The system can also be integrated with local law enforcement for rapid response. Experimental results demonstrate that the proposed system achieves efficient real-time performance with low computational overhead, making it more accurate, privacy-preserving, and suitable for deployment in public safety environments compared to existing approaches.

**KEYWORDS:**

Edge computing, women safety, surveillance system, behavior analysis, real-time detection, suspicious activity, video analytics, computer vision.

**DESIGN AND IMPLEMENTATION OF AN INTELLIGENT  
SHOPPING ASSISTANT USING BARCODE/QR CODE DETECTION  
AND TEXT-TOSPEECH FOR THE VISUALLY IMPAIRED**

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**ABSTRACT**

This project proposes a barcode and QR code scanning system designed to assist visually impaired individuals in identifying products through voice output. The system uses a webcam to capture real-time images and applies computer vision techniques to detect barcodes or QR codes. Upon detection, product information is retrieved from a predefined database and converted into speech using a text-to-speech (TTS) engine. The implementation is carried out in Python using libraries such as OpenCV for image processing, pyzbar for barcode detection, and pyttsx3 for speech synthesis. The system enables users to independently scan products and receive instant audio feedback, thereby enhancing accessibility and autonomy in everyday activities. Future improvements may include the integration of cloud-based databases, mobile application support, and AI-based object recognition to further enhance accuracy and usability.

**KEYWORDS:**

Barcode Scanning, QR Code Detection, Visually Impaired Assistance, Computer Vision, Text-to-Speech (TTS), OpenCV, Pyzbar, Pyttsx3, Product Identification, Accessibility, Assistive Technology.

**AI-BASED PRECISION FARMING SYSTEM FOR CROP  
RECOMMENDATION, DISEASE DETECTION, AND FERTILIZER  
MANAGEMENT**

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**ABSTRACT**

The AI-Based Precision Farming System for Crop Recommendation, Disease Detection, and Fertilizer Management is an intelligent agricultural solution developed to enhance productivity and support farmers in making accurate, data-driven decisions. In traditional farming, crop selection, disease identification, and fertilizer usage are often based on experience, which may lead to reduced yield and inefficient resource utilization. To overcome these challenges, the proposed system integrates advanced technologies such as machine learning and image processing to provide precise recommendations. The system analyzes important soil parameters including nitrogen, phosphorus, potassium levels, pH value, temperature, and humidity to suggest the most suitable crops for cultivation under specific environmental conditions. Furthermore, it utilizes image processing techniques to examine plant leaf images and detect diseases at an early stage, enabling timely intervention and minimizing crop loss. In addition, the system recommends appropriate fertilizers based on soil nutrient deficiencies, ensuring balanced nutrient management and improved soil health. By combining crop recommendation, disease detection, and fertilizer management into a single platform, the system reduces manual effort, increases efficiency, and promotes sustainable farming practices. Overall, this project aims to improve agricultural productivity, optimize resource usage, and provide a smart, reliable solution for modern precision farming.

**KEYWORDS:**

Precision Farming, Artificial Intelligence, Machine Learning, Crop Recommendation, Disease Detection, Image Processing, Fertilizer Management, Soil Analysis, Smart Agriculture, Sustainable Farming.

## **Automated Irrigation System for Intercropping Using ESP32 and mobile based application**

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### **ABSTRACT**

Efficient water management is a critical factor in modern agriculture, especially in intercropping systems where different crops have varying water requirements. This project presents the design and implementation of an IoTbased smart irrigation system that automates water supply based on real-time soil and environmental conditions. Soil moisture sensors are deployed at representative locations to monitor the moisture levels of different crop zones, while a temperature and humidity sensor provides additional environmental data.

The collected data is processed by the ESP32 microcontroller, which compares sensor values with predefined threshold levels to determine irrigation needs. A relay-controlled irrigation mechanism is used to supply water only when required, thereby minimizing water wastage. The system supports both automatic operation and manual control through a mobile application, enabling remote monitoring and management.

This approach enhances irrigation efficiency, reduces human effort, and ensures optimal water distribution in intercropping fields. The proposed system is cost-effective, scalable, and can be further improved by integrating advanced technologies such as weather prediction and artificial intelligence for smarter decision-making.

## **AI and IoT-BASED ELECTRIC VEHICLE MONITORING SYSTEM**

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### **ABSTRACT**

The AI and IoT-based Electric Vehicle Monitoring System is an intelligent solution designed to monitor, analyze, and enhance the performance, safety, and efficiency of electric vehicles (EVs). With the rapid adoption of electric vehicles, continuous monitoring of critical parameters such as battery health, state of charge, temperature, motor performance, and vehicle location has become essential to ensure reliability and optimal operation. Users can monitor vehicle status through a web or mobile dashboard that provides real-time visualization, historical data analysis, and automated alerts. Alerts are generated instantly when parameters exceed predefined thresholds, such as battery overheating or abnormal power consumption. The system supports scalability by allowing integration of additional features such as GPS tracking, driving behavior analysis, and energy optimization. The proposed solution offers a cost-effective, scalable, and smart approach to improving electric vehicle monitoring and management using AI and IoT technologies.

### **KEYWORDS**

ESP32, Battery Monitoring, Voltage Sensor, Current Sensor, GPS Module, GSM/Wi-Fi, IoT, Cloud Platform.

**LORA BASED SMART HOME WATER PUMP AUTOMATION  
USING MONOPOLE ANTENNAS AND CUSTOM WEB DOMAIN**

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**ABSTRACT**

In order to avoid water waste, motor damage, and excessive energy use, smart water management is crucial in contemporary homes. Conventional pump control techniques rely on wired systems or manual monitoring, which are ineffective and prone to human error. In this paper, an IoT-based LoRa-based smart water pump automation system is presented. While an ESP32 regulates pump operation via a dual relay mechanism, ultrasonic sensors keep an eye on the water levels in the sump and overhead tank. The ESP32 and a Raspberry Pi monitoring unit can reliably communicate over long distances thanks to LoRa modules with monopole antennas. With a timer-based safety feature, the system allows both manual override and automatic control. In residential applications, this method guarantees dependable water management while increasing efficiency and minimizing manual intervention.

**KEYWORDS:**

Water Pump Automation, LoRa Communication, ESP32, Raspberry Pi, Ultrasonic Sensor, Monopole Antenna, IoT, Smart Home System, Wireless Monitoring.

**Design and Implementation of a Three-Dimensional Password System for  
Enhanced User Security**

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**ABSTRACT**

In the modern digital era, ensuring secure user authentication has become a major challenge due to increasing cyber threats and unauthorized access. Traditional methods such as text-based passwords and biometric systems have limitations like vulnerability to attacks, poor memorability, and high cost. To overcome these issues, this paper proposes a Three-Dimensional Password (3D Password) system for secure user authentication. The system integrates multiple authentication factors including textual, graphical, and biometric inputs within a virtual 3D environment. Users interact with objects and perform specific actions, such as selecting items or navigating spaces, to create a unique password sequence. This method increases the password space and improves resistance against brute force, dictionary, and shoulder surfing attacks. The proposed system ensures high security, flexibility, and usability, making it suitable for applications like banking and secure data systems.

## **AUTONOMOUS BEDSIDE MEDICATION SERVICE ROBOT**

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### **ABSTRACT**

In modern healthcare environments, efficient and accurate medicine delivery is essential for patient safety and operational effectiveness. Traditional manual delivery methods are time-consuming, labor-intensive, and prone to human errors, especially in large hospital wards. This paper presents an autonomous bedside medication service robot designed to navigate hospital corridors, identify patient beds, and deliver medicines reliably. The system uses an STM32 microcontroller for real-time control and an ESP32 module for wireless communication and RFID-based identification. Navigation is achieved using encoder-based odometry combined with IMU-based heading correction, while ultrasonic sensors ensure obstacle avoidance. A load-cell-based mechanism verifies successful medicine delivery by detecting weight changes. The integration of embedded systems, sensor fusion, and automation improves accuracy, reduces workload, and enhances overall healthcare efficiency.

### **KEYWORDS**

Autonomous Robot, Healthcare Automation, STM32, ESP32, RFID, Ultrasonic Sensor, Load Cell, Embedded Systems, Medicine Delivery, IoT

## **HYBRID MACHINE LEARNING FRAMEWORK FOR TEXT AND VOICEBASED FAKE NEWS DETECTION**

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### **ABSTRACT**

The rapid proliferation of online information sharing has led to a significant societal challenge, as the spread of fake news can influence public opinion, create panic, and undermine trust in digital media. Traditional detection systems often fail to keep pace with evolving linguistic styles, multimodal content, and sophisticated manipulation strategies. To address these limitations, this paper proposes a Hybrid Machine Learning Framework for detecting fake news in both textual and voice-based content. The framework integrates Decision Trees, Random Forests, and Naive Bayes classifiers to achieve high detection accuracy while maintaining flexibility across diverse datasets. The model utilizes a combination of semantic features, such as word embeddings and sentiment analysis, and metadata-based attributes, including source credibility and publication patterns. Hyperparameter optimization is applied to enhance model performance and generalization. A unique aspect of the framework is its voice-based detection module, which converts audio news content into text through speech-to-text transcription and evaluates its credibility in real time, allowing the system to handle misinformation in spoken media. Experimental evaluations demonstrate that the proposed hybrid approach significantly outperforms conventional singleclassifier models in both accuracy and robustness. The results indicate that integrating multiple classifiers and multimodal analysis provides a scalable and effective solution for identifying evolving fake news trends. This framework contributes to the integrity of digital media platforms and strengthens public trust by providing timely, reliable, and automated fake news detection.

### **KEYWORDS**

Fake News Detection, Hybrid Machine Learning, Decision Trees, Random Forest, Naïve Bayes.

## **Fertilizer Recommendation and Disease Prediction Using CNN**

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### **ABSTRACT**

Agriculture plays a crucial role in ensuring food security and economic growth, but farmers often struggle with choosing the right fertilizers and identifying crop diseases at an early stage, which can lead to reduced yield and financial loss. This project presents an intelligent system for fertilizer recommendation and plant disease prediction using Convolutional Neural Networks (CNN). The system utilizes soil parameters such as nitrogen, phosphorus, potassium levels, pH value, and environmental conditions to recommend suitable fertilizers that enhance crop productivity while avoiding excessive usage. At the same time, a CNN-based model analyzes images of plant leaves to detect and classify diseases with high accuracy. By combining these two functionalities into a single platform, the system enables farmers to make better and faster decisions. The model is designed to provide real-time outputs through a simple and user-friendly interface, allowing users to input soil data and upload images easily. This approach not only helps in early disease detection and effective nutrient management but also promotes sustainable farming practices. Overall, the system reduces crop loss, improves yield quality, and supports the adoption of modern, technology-driven agriculture solutions.

### **KEYWORDS**

Convolutional Neural Network (CNN), Fertilizer Recommendation, Plant Disease Prediction, Smart Agriculture, Deep Learning, Image Processing, Soil Nutrient Analysis, Precision Farming, Crop Management, Sustainable Agriculture.

## **Car Connect: Full Stack Rental System with Integrated Analytics**

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### **ABSTRACT**

A *Car Connect: Full Stack Rental System with Integrated Analytics System* is a digital platform designed to modernize traditional car rental services by replacing manual processes with an automated and data-driven solution. The system allows users to browse available vehicles, check real-time availability, and make bookings through a simple and user-friendly interface, while also providing administrators with a centralized dashboard for managing vehicles, bookings, and overall operations. Developed using React, FastAPI, and MySQL, the platform ensures high performance, scalability, and reliability. An integrated analytics module enables businesses to analyze customer behavior, booking trends, and vehicle utilization, leading to better decision-making and improved efficiency. By addressing challenges such as lack of centralized management and inefficient workflows, the system enhances operational productivity. Additionally, the platform improves transparency by maintaining accurate digital records, reduces human errors in booking processes, and enhances customer satisfaction through faster service delivery. It also supports better resource allocation and operational planning through data insights. Future enhancements such as AI-based recommendations, GPS tracking, mobile application support, and online payment integration will further improve functionality and user experience.

### **KEYWORDS:**

Car Rental System, Smart Booking Platform, Data Analytics, FastAPI, React, MySQL, Real-Time Availability, Automation, Vehicle Management, AI Recommendation System

## **NEXT GENERATION TRAIN TRACK MONITORING USING MACHINE LEARNING**

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### **ABSTRACT**

Railway track monitoring and defect detection are very important for ensuring transportation safety and preventing accidents. Early identification of cracks and surface irregularities in railway tracks is crucial for maintaining reliable railway operations. Although manual inspections may identify certain defects, they are not always efficient or consistent for continuous monitoring.

Therefore, it is essential to utilize Artificial Intelligence and Internet of Things (IoT) technologies to assess and detect track defects accurately. In order to facilitate automated monitoring, a low-cost embedded system integrated with a deep learning model was designed and developed. This system uses an EsP32-CAM module to capture real-time track images, while a GPS unit provides location data for detected defects. The collected data are transmitted to a centralized server, where the system processes and analyzes the images. To accomplish this, a YOLOv8-based algorithm is implemented, which detects and classifies cracks based on confidence levels and spatial features.

The system continuously captures and evaluates track conditions, storing the detected defects in a structured database. The proposed system operates with low latency and improved accuracy, making it suitable for large-scale deployment across railway networks.

### **KEYWORDS**

Railway Track Monitoring, Crack Detection, YOLOv8, IoT, Predictive Maintenance

## AN AI-DRIVEN VIRTUAL TUTOR AND TEACHER ASSISTANT

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### ABSTRACT:

This project presents An AI-Driven Virtual Tutor and Teacher Assistant, an intelligent learning ecosystem that integrates automated lecture capture, AI-based assessment, and personalized study support to improve learning outcomes while reducing teacher workload. The system forms a closed learning loop by capturing lectures, structuring content, assessing learner understanding, and delivering targeted feedback. Recorded lectures are automatically converted into structured notes, concept summaries, and visual concept maps, while uploaded PDFs and topic-related videos contribute to a subject-specific knowledge base. Based on learner performance, the platform recommends relevant resources, previous examination questions, and topic-wise online tests with automated evaluation and weakness analytics. Unlike existing systems that rely on static content delivery, manual grading, and delayed, subjective feedback with minimal personalization, the proposed system employs an explainable, rubric-driven AI grading module that provides transparent, confidence-aware scoring and human-like feedback for descriptive answers. A conversational voice assistant further supports interactive concept clarification. In conclusion, the proposed system functions as a unified virtual tutor and teacher assistant, enabling efficient, self-directed, and inclusive learning through intelligent automation and continuous feedback.

### KEYWORDS:

AI in Education, Virtual Tutor, Automated Lecture Capture, Descriptive Answer Evaluation, Explainable AI, Personalized Learning, Teacher Assistant.

## **AI-BASED PRECISION FARMING SYSTEM FOR CROP RECOMMENDATION, DISEASE DETECTION, AND FERTILIZER MANAGEMENT**

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### **ABSTRACT:**

The AI-Based Precision Farming System for Crop Recommendation, Disease Detection, and Fertilizer Management is an intelligent agricultural solution developed to enhance productivity and support farmers in making accurate, data-driven decisions. In traditional farming, crop selection, disease identification, and fertilizer usage are often based on experience, which may lead to reduced yield and inefficient resource utilization. To overcome these challenges, the proposed system integrates advanced technologies such as machine learning and image processing to provide precise recommendations. The system analyzes important soil parameters including nitrogen, phosphorus, potassium levels, pH value, temperature, and humidity to suggest the most suitable crops for cultivation under specific environmental conditions. Furthermore, it utilizes image processing techniques to examine plant leaf images and detect diseases at an early stage, enabling timely intervention and minimizing crop loss. In addition, the system recommends appropriate fertilizers based on soil nutrient deficiencies, ensuring balanced nutrient management and improved soil health. By combining crop recommendation, disease detection, and fertilizer management into a single platform, the system reduces manual effort, increases efficiency, and promotes sustainable farming practices. Overall, this project aims to improve agricultural productivity, optimize resource usage, and provide a smart, reliable solution for modern precision farming.

### **KEYWORDS:**

Precision Farming, Artificial Intelligence, Machine Learning, Crop Recommendation, Disease Detection, Image Processing, Fertilizer Management, Soil Analysis, Smart Agriculture, Sustainable Farming.

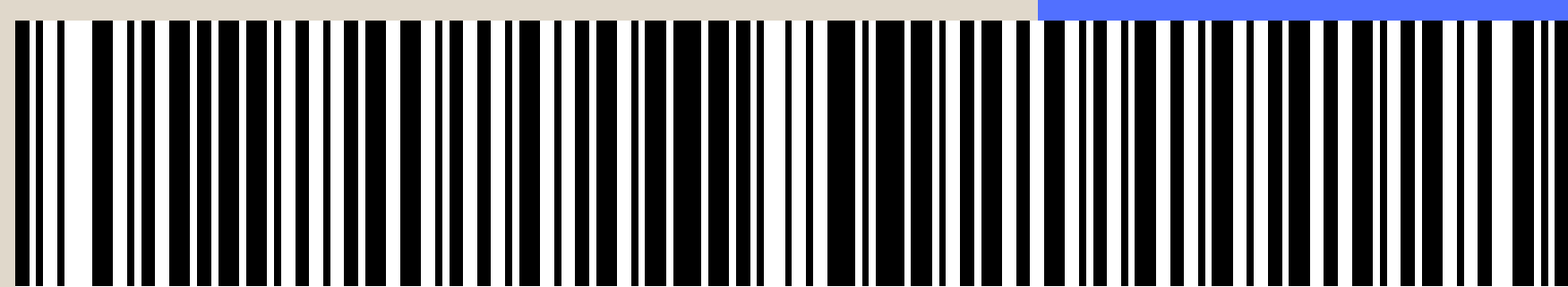
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978-93-5782-233-6