TECHNOVATE
Innovate, Present, Elevate

AMITY UNIVERSITY

# ABSTRACT BOOK

# TECHNOVATE 2025

## (IDEAS PROPEL INNOVATION)

21st – 22nd May 2025

**Annual Engineering Project & Poster Presentation**
**Shaping Tomorrow Through Engineering Excellence**

**Organized by:**
AMITY SCHOOL OF ENGINEERING & TECHNOLOGY
**Amity University Uttar Pradesh, Noida, India**

# ABOUT TECHNOVATE 2025

**Annual Engineering Project & Poster Presentation**

Shaping Tomorrow Through Engineering ExcellenceAt Amity, we believe in fostering innovation and creativity amongst our students, and the curriculum is well designed to provide appropriate platform to the students for working on their ideas by applying the Engineering principles. As part of the final semester academic requirement, every student is guided to carry out an outcome-oriented engineering project. **TECHNOVATE** is a platform to showcase few of these innovative and creative research/project work as a working model or poster. In total 300+ projects will be displayed in the form of poster or working model. **TECHNOVATE** is aimed to enthuse and motivate the students who are aspiring to pursue career in Science, Technology, Engineering and Mathematics (STEM).

**Highlights of TECHNOVATE 2025**

a. Showcase the technical skills and innovative ideas of Engineering Students
b. Explore and identify the potential projects that can be patented, incubated, or developed further as an industry ready product.
c. Interactive demonstrations and Q&A with presenters
d. Promote Industry Engagement
e. Facilitate Peer Learning and Knowledge Sharing
f. Provide Networking Opportunities

**Domains Covered (not limited to):** *Cloud Computing & Security, AI, Machine Learning, IOT, Automation in Healthcare & Agriculture, VLSI, Embedded System, Signal System, Communication, Industrial & Production, Energy, Thermal, Automotive, Drone Technology, Electric Vehicle, Power System, Sustainable Construction Material, Waste management, Software application in Building and Structures, Smart Health Monitoring and related engineering domain*

# ABOUT TECHNOVATE 2025

Technovate is an annual event organized by Amity School of Engineering and Technology. It aims to select brilliant students for research projects, promote interdisciplinary research, and identify innovative ideas for patents and publications. The event also appreciates student innovators and motivates them to focus on research and innovation.

# FOUNDER PRESIDENT'S MESSAGE

Dr. Ashok K. Chauhan, a renowned educationalist, industrialist, philanthropist and immensely successful entrepreneur in Europe for over three decades. With an aim of bringing together some of the brightest minds from all arenas he established the not-for-profit Ritnand Balved Education Foundation. He has provided a platform to youngsters by giving them global level professional education while instilling in them a sense of values. Amity is a leading global education group, established over 2 decades ago. Today, Dr. Chauhan's vision has translated into internationally benchmarked campuses that have come to epitomize the Amity Education Group. Today, Amity is home to over 150,000 brilliant students across Pre-nursery to Ph.D. levels pursuing more than 300 Programmes in 150 diverse disciplines.

The Group is driven by its vision of building up a Global Knowledge Network providing globally benchmarked education. Currently, the Group comprises of 9 Universities; 25 schools and 11 international campuses across London, Singapore, Dubai, New York, Mauritius, China, Abu Dhabi, South Africa, Romania and Tashkent amongst others. This tremendous and unmatched growth of Amity is a culmination of hi-tech campuses, dedicated faculty and unparalleled corporate interaction. Grounded to his dreams, he always believed in the policy of leading one eye on vision and one eye on implementation. It is therefore no surprise that Dr. Chauhan's innovative and far-sighted strategies have transformed the education landscape of the country. He is the man who gave us the golden success mantra of four `E's – Edge, Enthusiasm, Excellence and Execution in all walks of life.

**Dr. Ashok K. Chauhan**
Founder President, Ritnand Balved Education Foundation (RBEF)
(The Foundation of Amity Institutions and the Sponsoring Body of Amity Universities)
Chairman, AKC Group of Companies

# CHANCELLOR'S MESSAGE

Dr. Atul Chauhan is the President of the not-for profit Ritnand Balved Education Foundation and the Chancellor of Amity University Uttar Pradesh. Dr. Chauhan is also the CEO of the AKC Group of Companies which has worldwide interests in the fields of plastics, healthcare and technology. Amity is a leading not-for-profit education group of India with over 150,000 students across London, Singapore, Dubai, Abu Dhabi, Sharjah, San Franscisco, Mauritius, South Africa, Romania, Amsterdam, Uzbekistan and also 175-acre Amity Global Research Hub at New York/ Long Island, besides India. Dr. Chauhan is a member of many government and statutory bodies. Born and brought up in Germany. Dr. Chauhan attained his higher education in the field of engineering and finance from University College London and London School of Economics. His vision is to create centres of thought leadership across the world, where faculty, scientists and brilliant students can explore and expand the frontiers of knowledge.

**Dr. Atul K. Chauhan**
Chancellor, Amity University
President, Ritnand Balved Education Foundation

# VICE-CHANCELLOR'S MESSAGE

It is a matter of great delight that Amity School of Engineering and Technology is organizing Technovate 2025 — an outstanding initiative that nurtures innovation, fosters research, and celebrates inventions led by our brilliant student community.

Technovate stands as a testament to Amity's vision of empowering youth with a spirit of curiosity and creativity. It provides an enriching platform for students to showcase technical skills, engage in interdisciplinary research, and work on ideas that have the potential to evolve into patents and impactful innovations. The emphasis on peer learning, industry engagement, and networking opportunities makes this event truly holistic and future-ready.

In today's dynamic world, it is critical to build an academic ecosystem where young minds are encouraged to think beyond the conventional, explore novel ideas, and translate their knowledge into tangible solutions. Technovate does exactly that—fueling innovation that contributes not only to academic excellence but also to the larger goal of national development and global progress.

Under the visionary leadership of our Hon'ble Founder President, Dr. Ashok K. Chauhan, Amity has continuously championed innovative thinking, research excellence, and entrepreneurship. Technovate 2025 is yet another initiative that aligns with this mission by fostering collaboration between academia, research, and industry.

I congratulate the organizing team, faculty mentors, and all participating students for their passion and commitment. I am confident that this event will continue to inspire the next generation of innovators and changemakers.

**Best wishes for the resounding success of Technovate 2025!**

**Prof. (Dr.) Balvinder Shukla**
Vice Chancellor, Amity University Uttar Pradesh

# DIRECTOR'S MESSAGE

It gives me immense pleasure to present Technovate 2025, a flagship initiative of Amity School of Engineering and Technology, designed to empower our students through innovation, research, and invention.

Technovate is more than just an event—it is a dynamic platform where aspiring engineers and researchers showcase their technical prowess, explore interdisciplinary solutions, and contribute ideas with the potential to shape the future. By identifying patent-worthy innovations and encouraging original research, Technovate serves as a launchpad for students to transform their creativity into impactful contributions to society.

This event exemplifies ASET's commitment to academic excellence and experiential learning. With highlights including peer learning, industry engagement, and opportunities for collaboration, Technovate 2025 supports University's mission to prepare industry-ready professionals and responsible global citizens.

I am proud of the enthusiasm and dedication of our students and faculty, whose contributions continue to make Technovate a resounding success each year. I extend my sincere appreciation to our industry partners, mentors, and the organizing committee for their continued support in nurturing a culture of research and innovation.

Let us continue to strive toward excellence, create future-ready solutions, and drive meaningful change through Engineering and technology.

Wishing all participants a successful and inspiring Technovate 2025!

**Prof. (Dr.) Manoj Kumar Pandey**
Director, Amity School of Engineering and Technology (ASET)

# ORGANIZING TEAM

## CHAIR

**Prof. (Dr.) Manoj Kumar Pandey**

Director & Head of Institute, ASET

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## CORE COMMITTEE

**Prof. (Dr.) Madhuri Kumari**

Dy. Director, Placement Industry Relations, ASET

**Prof. (Dr.) Nitasha Hasteer**

Dy. Director, Academics, Professor & Head-IT, ASET

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## ORGANIZING COMMITTEE

- **Dr. Sindhu Hak Gupta**
  Department of Electronics and Communication Engineering
- **Dr. Vasudha Vashist,** Department of Computer Science and Engineering
- **Dr. Anjali Jain,** Department of Electrical and Electronics Engineering
- **Dr. Meeta Sharma,** Department of Mechanical Engineering
- **Mr. Kamlesh Pandey,** Department of Electrical and Electronics Engineering
- **Dr. Richa Sharma,** Department of Information Technology
- **Mr. Prakhar Duggal,** Department of Civil Engineering
- **Mr. Jitendra S Jadon,** Department of Artificial Intelligence

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# ABSTRACTS

## DEPARTMENT OF EEE

# AI & MACHINE LEARNING BASED DESIGN OF AN EMERGENCY USE OXYGEN GENERATOR USING PSA FOR PORTABLE VENTILATOR

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**Abstract:** The Development of effective and portable oxygen generating systems is required due to the growing need for portable ventilators, particularly in emergency situations like pandemics, natural disasters, and remote healthcare settings. To provide a dependable, economical, and sustainable oxygen supply for portable ventilators, this research focuses on the AI & Machine Learning (ML)-Based Design of an Emergency Use Oxygen Generator using Pressure Swing Adsorption (PSA) technology. Using zeolite adsorbents, the PSA method selectively extracts oxygen from ambient air, producing high-purity oxygen without the need for complicated infrastructure or cryogenic storage. Utilizing AI and ML algorithms, the system maximizes oxygen purity and flow rate while reducing power consumption by optimizing critical parameters like pressure levels, adsorption/desorption cycle time, and energy efficiency. Intelligent defect detection and adaptive real-time control are made possible by machine learning models that forecast system performance under a range of operational and environmental circumstances. Additionally, the design incorporates IoT-based remote access and smart monitoring, enabling medical practitioners to monitor system performance, identify leaks, and guarantee continued functioning with little manual intervention. The oxygen generator is an essential portable ventilator solution in emergency situations and resource-constrained environments because of its AI-driven approach, which improves efficiency, adaptability, and dependability.

**Keywords:** Oxygen-Generator, Portable, PSA, Machine Learning, AI

# AUTOMATED POLYHOUSE CLIMATE CONTROL SYSTEM USING PELTIER-BASED TEMPERATURE REGULATION AND SMART SENSOR INTEGRATION

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**Abstract:** The Automated Polyhouse Climate Control System is a cutting-edge solution designed to revolutionize agriculture by leveraging advanced technologies for precise environmental regulation. This system utilizes Peltier modules and a water-based humidification mechanism to maintain optimal temperature and humidity within polyhouses, ensuring ideal conditions for plant growth. Integrated sensors for nitrogen levels, fertilizer inputs, and soil conditions provide real-time data for monitoring and management, enabling a high degree of precision in farming operations. The automation of operations is achieved through a microcontroller-based system, which reduces human intervention and enhances efficiency. A user-friendly interface allows users to monitor and control the system effortlessly, making it accessible even to individuals with minimal technical knowledge. The design emphasizes energy efficiency, incorporating renewable energy sources like solar panels to support sustainable farming practices. Additionally, the system is scalable, catering to both large-scale agricultural enterprises and small-scale micro-farms. This system not only addresses the needs of commercial farming but also empowers individuals to create their own micro-farms for producing home-grown food. By providing a controlled environment, it reduces the reliance on harmful insecticides and pesticides, promoting healthier food production. The system's scalability and affordability make it an ideal solution for urban households, small communities, and rural areas seeking to embrace sustainable and self-reliant farming practices.

**Keywords:** Agriculture; Polyhouse; Automation; Energy Efficiency; Sustainable Farming; Affordability.

# DESIGN AND DEVELOPMENT OF ELECTRIC SCOOTER FOR URBAN MOBILITY

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**Abstract:** Urban mobility is transforming with the adoption of sustainable and efficient transportation solutions. Electric scooters have emerged as a viable alternative for short-distance commuting, helping reduce traffic congestion, carbon emissions, and environmental pollution. This study focuses on designing and developing an optimized electric scooter for urban mobility, emphasizing a lightweight yet durable frame, an efficient battery management system, and intelligent control mechanisms for enhanced safety and performance. By integrating modern design principles with advanced engineering solutions, the research aims to balance functionality, cost-effectiveness, and user comfort. Additionally, it evaluates energy efficiency, charging infrastructure, and smart connectivity to enhance the user experience.

Moreover, the study examines policy implications, regulatory challenges, and the integration of electric scooters into existing urban transport ecosystems. By addressing issues related to infrastructure, battery recycling, and user safety, this project aims to contribute to the widespread adoption of electric scooters as a mainstream transportation solution. The proposed electric scooter serves as a step towards sustainable urban mobility, offering a practical, eco-friendly, and technologically advanced alternative for modern cities.

**Keywords:** Electric Scooter, BMS, Engineering, Energy, Cost.

# HARDWARE DESIGN OF SMART LANDMINE DETECTION ROBOT

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**Abstract:** The Smart Landmine Detection Robot is designed to enhance landmine detection using penetrating radar (GPR), metal detectors, smoke sensors, and an ESP-32 camera for real-time monitoring. To improve detection accuracy and adaptability, the system integrates fuzzy logic-based AI, enabling intelligent decision-making based on sensor data. The hardware design focuses on durability and efficiency, incorporating a reinforced chassis, high-precision sensors, motors, batteries, and an Arduino microcontroller. GPR technology enhances subsurface scanning, allowing for deeper and more accurate detection of buried landmines. The fuzzy logic AI system processes uncertain or overlapping sensor data, improving adaptability to various terrains and reducing false detections. Extensive testing was conducted to ensure hardware reliability, sensor accuracy, and AI-driven detection efficiency. The system was refined to enhance its stability and operational effectiveness in real-world scenarios. This cost-effective, AI-enhanced robotic solution offers improved safety and accuracy in landmine detection, making it highly suitable for humanitarian demining efforts and military applications.

**Keywords:** Smart Landmine Detection, Ground Penetrating Radar (GPR), Fuzzy Logic AI, Sensor Integration, Humanitarian Demining.

# HEAD TILT CONTROLLED WHEELCHAIR WITH BLUETOOTH AND ARDUINO

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**Abstract:** The Head Tilt Controlled Wheelchair is an innovative assistive mobility solution designed to enhance the independence of individuals with severe physical disabilities. Utilizing an MPU6050 accelerometer-gyroscope sensor mounted on a headband, the system detects head tilts to control the movement of the wheelchair. An Arduino microcontroller processes the sensor data and wirelessly communicates with the wheelchair's motor driver via Bluetooth (HC-05 module), ensuring seamless and responsive motion control. The wheelchair operates in four primary directions—forward, backward, left, and right—based on calibrated head movements, with an emergency stop feature for safety. The system is designed for low power consumption, using a 12V rechargeable battery pack, making it efficient and cost-effective. The integration of wireless Bluetooth control eliminates excessive wiring, improving the ease of use and reliability. This assistive technology aims to empower individuals with mobility impairments, offering a user-friendly, affordable, and scalable solution for enhancing their quality of life.

**Keywords:** Assistive Technology; Head Tilt Control; Bluetooth Wheelchair; Arduino; MPU6050; Wireless Mobility; Disability Assistance.

# IMPLEMENTATION OF DOPPLER RADAR IN ADVANCED DRIVER ASSISTANCE SYSTEM (ADAS)

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**Abstract:** Lidar and radar systems are widely used in Advanced Driver Assistance Systems (ADAS) and autonomous driving for environment detection, object mapping, speed estimation, and distance measurement. However, most of these systems are laser-based, making them less effective in low-light and foggy conditions. In contrast, Doppler radar offers a more reliable alternative as it functions efficiently in all lighting and weather conditions. Additionally, it excels in measuring high speeds, a challenge for many conventional systems. Doppler radar operates on the principle of the Doppler effect, which explains the shift in frequency or wavelength of waves when there is relative motion between the wave source and an observer. As an object emitting waves moves, the waves compress in front of it and stretch behind, leading to a perceptible frequency shift. This characteristic allows Doppler radar to accurately detect and track moving objects, making it an essential technology for ADAS. By leveraging Doppler radar, autonomous vehicles can achieve enhanced safety and performance, ensuring precise environmental sensing even in challenging conditions such as fog, darkness, and high-speed scenarios.

**Keywords:** Doppler Radar, Advanced Driver Assistance Systems (ADAS), Object Detection, Collision Avoidance, Sensor Fusion, Radar Signal Processing.

# ABSTRACTS

DEPARTMENT OF IT

# ADVERSARIAL-RESILIENT MALWARE DETECTION VIA ENCRYPTED TRAFFIC ANALYSIS AND CONVOLUTIONAL NEURAL NETWORKS

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**Abstract:** Malware detection is a critical aspect of cybersecurity, with attackers constantly evolving their techniques to evade traditional defence mechanisms. This research proposes an adversarial-resilient malware detection system that leverages encrypted traffic analysis and Convolutional Neural Networks (CNNs) to enhance detection accuracy. The study explores the use of image-based malware classification, employing deep learning architectures such as ResNet50 and VGG19. A dataset of over 150,000 grayscale images generated from malware binaries is utilized to train and evaluate the models. To enhance robustness, adversarial training techniques are implemented, mitigating the impact of adversarial attacks. Comparative analysis of different architectures is conducted based on performance metrics including accuracy, precision, recall, and F1-score. Experimental results demonstrate that integrating adversarial training significantly improves the model's resilience against evasion attempts. This research contributes to the advancement of malware detection methodologies by introducing a robust deep learning-based approach capable of identifying threats in encrypted network traffic.

**Keywords:** Malware Detection, Convolutional Neural Networks, Encrypted Traffic Analysis, Adversarial Training, Cybersecurity

# AL CONNECT: AN INTELLIGENT EDUCATIONAL PLATFORM

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**Abstract:** AI Connect is an AI-driven learning platform that seeks to improve the online tutoring experience by integrating robust artificial intelligence with interactive virtual learning tools. The primary objective was to deliver an intuitive and personalized learning environment that supports both students and tutors through real-time video interaction, interactive whiteboard collaboration, scheduling tools, and resource sharing. The project was created based on a systematic approach with UI/UX design via Figma and development via React.js, Node.js, and MongoDB for high-performance features. Integration with AI, including chatbots and recommendation systems created with TensorFlow, Keras, and scikit-learn, supports adaptive learning paths and real-time question answering. Video conferencing features were incorporated via WebRTC for seamless interaction. Rigorous testing was performed to achieve functionality, and secure authentication features safeguarded user information. Through this project, we realized the importance of integrating AI in education to support adaptive learning experiences and maximize engagement. The platform culminates in delivering a scalable, secure, and intelligent solution to improve academic success, accessibility, and overall development in virtual learning.

**Keywords:** Artificial Intelligence, E-Learning, Virtual Classrooms, Jitsi, Recommendation System

# PREDICTING STOCK MARKET: STRATEGIES OF ENSEMBLE LEARNING

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**Abstract:** Accurate stock market predictions are crucial for financial decision-making and investment planning. Traditional models like Linear Regression struggle with the market's non-linear patterns, while Long Short-Term Memory (LSTM) networks effectively capture sequential dependencies. This study forecasts RIL stock prices for 2020–2025 using Linear Regression and LSTM models. The process involves collecting stock data from Yahoo Finance, preprocessing it, and training the models separately. Predictions are combined using ensemble techniques like weighted averaging, and performance is evaluated using MAE, RMSE, and MSE. Results indicate that ensemble learning enhances prediction accuracy by integrating the interpretability of traditional models with the adaptability of deep learning. While ensemble techniques improve reliability, hybrid models show even greater precision, aiding investors in making informed decisions.

**Keywords**: Stock Market Prediction, Ensemble Learning, LSTM Networks, Linear Regression, Financial Forecasting

# ARCHITECTURAL AND PERFORMANCE ANALYSIS OF TEXT TO-IMAGE AND TEXT-TO-VIDEO GENERATIVE MODELS

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**Abstract:** Generative AI models are transforming content creation, but real-world use faces challenges in performance, cost, and efficiency. This study evaluates leading models for images (DALL·E, Stable Diffusion, StyleGAN2) and videos (VideoGAN, MoCoGAN), analyzing their strengths, limitations, and technical bottlenecks. DALL·E excels in photorealism, Stable Diffusion offers flexible styles, and StyleGAN2 delivers high-quality images but struggles with text-to-image tasks. In video generation, MoCoGAN outperforms VideoGAN in complex scenes but lacks long-term motion consistency. Benchmarks reveal trade-offs: diffusion models spend 44% of runtime on convolutions, while transformers waste 49% on linear layers. Flash Attention optimizations improve diffusion models by 1.1–2.5× more than transformers. However, video generation remains costly, with 60% of processing time dedicated to motion modeling. Diffusion trains 30% faster than StyleGAN2 but consumes 20% more GPU memory. New visual tools like radar charts and heatmaps enhance comparisons of speed, cost, and quality, providing valuable insights for optimizing AI-driven content creation.

**Keywords:** Generative AI, Image synthesis, Video generation, Diffusion models, Computational efficiency.

# CRYPTOGRAPHIC PROTOCOL ENHANCEMENT IN QUANTUM ENVIRONMENTS-MALWARE ANALYSIS

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**Abstract:** Modern cybersecurity relies heavily on malware identification and analysis, which calls for effective and scalable deep learning models. In the past, we used the large-scale language model Falcon-7B to analyze network connection data and find malicious activity. Falcon-7B's computing needs made real-time analysis and deployment difficult, particularly in contexts with limited resources, even if it offered great contextual knowledge. In order to solve this, we switched to DistilBERT-base-uncased, a small and effective transformer model that greatly lowers memory and processing overhead while maintaining a large portion of BERT's speed. By using DistilBERT on labelled network traffic data, we can more quickly and effectively identify patterns that differentiate between benign and malicious activity. We guarantee low information loss while speeding up inference by optimizing the tokenization and preprocessing stages. According to preliminary findings, DistilBERT significantly reduces training and inference durations while achieving accuracy equivalent to Falcon-7B, which makes it more appropriate for real-world applications where quick threat detection is crucial. This shift emphasizes how crucial it is to use models for cybersecurity that balance interpretability, accuracy, and computational viability. In order to improve generalization across various virus families, future work will involve increasing the dataset and using more optimization approaches.

**Keywords:** Cybersecurity, Falcon-7B, DistilBERT(Distilled Bidirectional Encoder Representations from Transformers), Malware

# D.R.A.G.O.N.: DIRECTIVE RETRIEVAL AUGMENTED GENERATION OPTIMIZED NAVIGATOR

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**Abstract:** The project, titled "Directive Retrieval Augmented Generation Optimized Navigator" (DRAGON), aims to enhance the capabilities of Large Language Models (LLMs) by integrating Retrieval-Augmented Generation (RAG) with agent frameworks. This project addresses the limitations of traditional LLMs, such as their reliance on static knowledge and the propensity to generate inaccurate or hallucinated information. DRAGON web application utilizes ADAPTER, a novel deep research framework that synergistically combines Adam optimizer inspired planning with Reinforcement Learning from Human Feedback (RLHF) in a Human-in-the-Loop (HITL) setting. The agent developed for Deep Research for researchers use case is designed to not only perform research efficiently but also acquire the research taste and inclination of the researcher. The agent is initially HITL heavy with the planning agent initially relying on the explicit human feedback to allow the user to edit and change the course of deep research on the fly. The responses to the HITL queries serve as direct gradient signals that help in shaping a learned reward model that that reflects user preferences. Over time as the RLHF Layer matures it acts as a filter and answers more and more HITL queries and guiding the planning agent, making the application HITL light and integrating research taste of the researcher into research planning. The planning agent inspired from Adam Optimizer, models the planning process as the balance between long term user-aligned intent modelled as momentum and short-term research interests and contextual variability as adaptive variance, combining persistent strategic direction with recency sensitive adjustments. It makes the planner consistent over long-horizon tasks. The framework is domain-agnostic and well suited for applications that require deep user alignment and adaptive planning such as scientific research and autonomous exploration. HITL enforced RLHF improving an Adam Planner put in a MCP architecture establishes a theoretical foundation for agents that learn to balance external guidance with internalized decision making over time.

**Keywords:** RLHF, HITL, LLM Agents, MCP, Adam Optimizer

# DETECTING AND WATERMARKING FAKE VIDEOS USING AI MODEL

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**Abstract:** Rapid advancements in deepfake technology have produced incredibly lifelike but dishonest videos that propose serious risks, such as false information, identity theft, and damage to one's reputation. For digital media to remain authentic and intact, deepfake video detection is essential. The goal of this project is to create an AI-based detection system that uses a combination of ResNet-50 and Convolutional Neural Networks (CNNs) models or algorithms for spatial analysis based on video frame inputs and also attempts to watermark the fake detected ones. The model is trained and assessed using datasets including Deepfake Faces, FaceForensics++, Celeb-DF, and the Deepfake Detection Challenge. To distinguish between actual and false videos, the detection method looks for visual artefacts, inconsistent lighting, and abnormalities in facial movements. The detection performance ranges from 90% to 95%, according to evaluation parameters like accuracy, precision, recall, and F1-score.

As a future scope, the project aims to enhance the watermarking technique by embedding robust, imperceptible marks in manipulated videos to ensure traceability and prevent further unauthorized use. Experimentation with different AI models, such as Vision Transformers (ViTs) and Generative Adversarial Networks (GANs)-based detection, will be explored to improve accuracy and adaptability to newer deepfake techniques. Further research will also focus on real-time detection and optimizing computational efficiency to make the system viable for large-scale deployment on digital platforms.

**Keywords:** Deepfake detection, AI-based models, CNN, ResNet50, Watermark.

# FACIAL RECOGNITION-BASED WEB ACCESS CONTROL

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**Abstract:** Facial recognition technology has emerged as a reliable and secure method for identity verification in access control systems. This research presents a facial recognition-based web access control system designed to enhance security and automate authentication processes in organizations. The system utilizes deep learning-based face recognition techniques to grant or deny access based on stored facial data. Performance evaluation indicates an accuracy of 96% in optimal conditions, with a slight decline under challenging scenarios such as low lighting and partial occlusion. Additionally, precision and recall rates of 94% and 89%, respectively, demonstrate the system's effectiveness in distinguishing between authorized and unauthorized users. The system also maintains an acceptable False Acceptance Rate (FAR) of 3% and False Rejection Rate (FRR) of 8%, ensuring a balanced trade-off between security and usability. Scalability tests confirm that execution time increases linearly as the number of users grows. The study concludes that facial recognition-based access control offers a robust and efficient alternative to traditional authentication methods, with potential applications in educational institutions, corporate offices, and secure facilities. Future improvements will focus on enhancing performance under extreme lighting variations and optimizing real-time processing speed.

**Keywords:** Facial Recognition, Access Control, Deep Learning, Biometric Authentication, Web Security, False Acceptance Rate (FAR)

# FACTORS AFFECTING THE SECURITY OF ONLINE AUCTION SYSTEM

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**Abstract:** Online auctions have become a popular option for e-commerce, offering better convenience, lower pricing, and accessibility to products and marketplaces. However, security concerns remain a significant challenge, hindering wider adoption and eroding user trust. This work investigates the key factors affecting the security of online auctions, with a particular focus on user authentication, including facial recognition and credential-based authentication. The work employs a mixed-methods approach to analyze authentication, highlighting how weak password policies and the absence of multi-factor authentication (MFA) can lead to unauthorized access. The research investigates security threats, including real-time bidding (RTB) manipulation, phishing scams, and fraudulent listings. A key focus of this study is the effectiveness and limitations of traditional authentication systems, which are often vulnerable to brute-force attacks and social engineering tactics. Additionally, the research explores the potential of emerging authentication technologies, particularly facial recognition, to enhance security. It also examines advancements in hashing techniques for credential-based authentication, aiming to strengthen ID-password security. The findings offer valuable insights for users, platform providers, and policymakers striving to establish a more secure online auction system.

**Keywords:** Online Auction System; Facial Recognition; Multi-Factor Authentication; Real- Time Bidding; Cybersecurity

# HEALTH BUDDY: COMPREHENSIVE HEALTH MANAGEMENT SOLUTION

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**Abstract:** The digital transformation of healthcare in India has introduced innovative solutions to longstanding challenges, with e-prescription systems playing a vital role in improving patient safety and clinic workflow. This paper critically examines the implementation and impact of e-prescription systems in India, highlighting their role in minimizing prescription errors, enhancing efficiency, and boosting patient compliance. Integration with electronic medical records (EMRs) and health databases like the Ayushman Bharat Digital Mission has significantly strengthened healthcare delivery. However, interoperability between government and private healthcare systems remains a challenge. Economic analysis indicates that although the initial investment in e-prescription systems is high, the long-term benefits — including reduced hospital readmissions and lower administrative costs — make them cost-effective. The proposed framework demonstrates a 51.2820% reduction in prescription errors and an improvement in patient compliance rates from 55% to 70%. This work emphasizes the transformative potential of e-prescriptions in building a more efficient, accessible, and sustainable healthcare system in India.

**Keywords:** E-Prescriptions, Prescription Errors, Patient Compliance, Intero Electronic Medical Records (EMRs)

# HEART DISEASE PREDICTION USING MACHINE LEARNING

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**Abstract:** Heart disease remains a major global health concern, contributing to high mortality rates. Early detection is crucial for effective intervention and treatment. This project presents a web-based Heart Disease Prediction System using machine learning algorithms to assess an individual's risk of heart disease. The system analyzes key health parameters such as age, cholesterol levels, blood pressure, and lifestyle factors to train predictive models, including Random Forest, Support Vector Classifier (SVC), and Logistic Regression. The FastAPI framework is used to deploy the trained model, ensuring efficient backend processing, while Supabase manages secure user data storage. The frontend is developed using React.js, providing an interactive dashboard for users to input data and visualize prediction results with real-time charts and analytics. Rigorous testing ensures accuracy and reliability. The system serves as a cost-effective, accessible, and scalable tool for preliminary heart disease assessment, assisting both individuals and healthcare professionals in proactive decision-making.

**Keywords:** Heart Disease, Machine Learning Models, Prediction, FastAPI, Web Application

# IOT-ENABLED SMART LIGHTING FOR URBAN AREAS

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**Abstract:** Rapid urbanization presents challenges in managing energy consumption, public safety, and sustainable infrastructure. Traditional street lighting systems are inefficient, energy-intensive, and lack real-time adaptability, contributing to excessive carbon emissions. The Internet of Things (IoT) offers a transformative solution by enabling smart, automated, and energy-efficient lighting systems. This project focuses on designing a scalable, sensor-driven IoT-enabled smart lighting system for urban environments. The system dynamically adjusts lighting based on real-time environmental factors such as pedestrian movement, vehicle traffic, weather conditions, and daylight availability. Using IoT sensors and wireless communication, it optimizes energy consumption while maintaining safety and visibility. Additionally, the system integrates seamlessly with existing urban infrastructure and smart city platforms. A centralized control unit collects and analyses data from distributed IoT nodes, identifying lighting patterns and predicting maintenance needs through anomaly detection. This proactive approach reduces downtime, operational costs, and maintenance efforts, ensuring improved energy efficiency, enhanced public safety, and sustainable urban development.

**Keywords:** IoT, smart lighting, metropolitan cities, energy efficiency, smart city

# KILOWATT COMPASS: A COMPREHENSIVE APPLICATION FOR ELECTRIC VEHICLE CHARGING OPTIMIZATION IN INDIA

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**Abstract:** The adoption of electric vehicles (EVs) as a sustainable mode of transport poses unique challenges, especially regarding the availability and accessibility of charging infrastructure. As more people shift towards EVs, the need for a well-connected and efficient charging network becomes crucial. This paper presents Kilowatt Compass, a web application designed to support EV users in India by providing real-time information about electric vehicle charging locations. The platform offers various functionalities, including station location tracking, real-time availability updates, station reservations, and integration with bulk charging networks. By leveraging technologies such as React.js, the application ensures a smooth user experience. Through the development and testing of this platform, we learned that real-time data accuracy and seamless integration with charging networks are crucial for user adoption. The app aims to enhance the EV driving experience by reducing range anxiety, simplifying the search for charging stations, and promoting an efficient transportation system. Our findings suggest that tools like Kilowatt Compass can significantly improve the accessibility of EV infrastructure, making sustainable transport more practical and convenient for users.

**Keywords:** Electric Vehicles (EVs), Charging Station Locator, Real-Time Data Integration, Reservation System, EV Adoption.

# LANGUAGE LEARNING CHATBOT USING JAVA

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**Abstract:** A language learning chatbot offers an innovative and highly interactive way to assist users in practicing, understanding, and acquiring new languages efficiently. This research project, developed using the Java programming language, focuses on building a multilingual chatbot that is capable of understanding, processing, and responding accurately in Hindi, English, Spanish, French, Chinese, and Japanese. Utilizing advanced Natural Language Processing (NLP) libraries and algorithms, the chatbot facilitates users in developing essential language skills such as vocabulary enhancement, grammatical correctness, sentence formation, and pronunciation improvement. The backend structure, designed with Java, ensures high-level platform independence, while the frontend is equipped with a user-friendly, animated, and visually appealing interface to ensure an engaging learning environment. The project successfully demonstrates the seamless integration of Java-based graphic user interface (GUI) components along with machine learning models to foster basic language comprehension. This chatbot is suitable for beginners who are just starting their language journey as well as for intermediate learners aiming to refine their skills. Potential future enhancements could include features such as real-time speech recognition, adaptive learning techniques, and AI-based personalized tutoring paths to offer a real-life interactive learning experience.

**Keywords:** Language learning, Chatbot, Java, Natural language processing (NLP), Multilingual

# LINGUISTIC TO VIDEO TRANSFORMATION SYSTEM

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**Abstract:** Diffusion models have transformed generative modelling, especially for high-quality picture synthesis. Stable Diffusion, a cutting-edge generative model, excels in creating semantically consistent and visually detailed images. However, extending these capabilities to text-to-video conversion poses considerable hurdles. Aside from guaranteeing alignment with the input text, output movies must be visually and temporally coherent between frames. In this study, we suggest a two-step approach: first, textual descriptions are translated into extremely detailed images, and then the images are synthesised into video sequences using the Stable Diffusion model. To improve coherence, we use advanced image processing techniques such frame interpolation, motion estimation, and temporal consistency enforcement. Frame interpolation smooths transitions by inserting interim frames, whereas motion estimation aligns material over consecutive frames. Furthermore, frame generation is dynamically changed in response to contextual changes in the text, ensuring both visual and narrative consistency. Preliminary results show that our approach is effective at generating semantically matched videos, with potential applications in automated video content development, narrative, and multimedia production.

**Keywords:** Text to Video Generation; Diffusion Models; Generative AI

# LUMINANCE -IMAGE VISIBILITY RESTORATION - USING NATURAL LANGUAGE PROCESSING

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**Abstract:** This study presents a comprehensive system for oyster health assessment using underwater images, integrating detection, classification, segmentation, time prediction, and automated reporting. The system addresses key challenges in aquaculture by enabling real-time monitoring and early disease detection. The Single Shot MultiBox Detector (SSD) is employed for real-time oyster detection, offering high-speed performance suitable for underwater environments. For health classification, explainable AI (XAI) techniques, including Grad-CAM, visualize model decisions, categorizing oysters into three health states: healthy, early decay, or dead, enhancing interpretability and trustworthiness. To improve precision, the Segment Anything Model (SAM) by Meta AI performs semantic segmentation, accurately delineating oyster regions from complex seabed backgrounds, such as coral reefs and sandy surfaces. The system also predicts the time of death using XGBoost and LightGBM regression models, combining environmental data (e.g., temperature, salinity) with image features, providing valuable insights into mortality timelines. For streamlined data processing, BERT automates health status labelling, while GPT-4 generates detailed, coherent reports, summarizing detection results, classification trends, and environmental correlations. The system also offers visual analytics with heatmaps and graphs, aiding decision-making. This multi-objective framework offers a scalable, interpretable, and automated solution for oyster monitoring, supporting early disease detection, improving aquaculture sustainability, and aiding in marine conservation efforts.

**Keywords:** Oyster detection, SSD, Grad-CAM, XAI, SAM, XGBoost, LightGBM, BERT

# NEATNOTESAI: AI ASSISTED HANDWRITING RECOGNITION FRAMEWORK FOR DYSGRAPHIA

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**Abstract:** Dysgraphia is a learning disability that affects a person's handwriting and poses significant challenges in education and communication. NEATNOTESAI is an AI-assisted handwriting recognition framework designed to aid individuals with dysgraphia by improving text interpretation and digital transcription. This framework leverages advanced machine learning models, including Convolutional Neural Networks (CNNs) and Natural Language Processing (NLP) techniques, to analyze and enhance written input. It incorporates an adaptive learning mechanism that customizes recognition patterns based on individual handwriting styles, ensuring high accuracy. The system also integrates a user-friendly interface for real-time feedback and corrections. Our research focuses on improving accessibility, reducing transcription errors, and facilitating seamless integration with assistive technologies. Preliminary results indicate a significant improvement in recognition accuracy and usability for individuals with dysgraphia. This AI-driven approach aims to bridge the gap between handwritten content and digital platforms, offering an inclusive solution for educational and professional applications.

**Keywords:** Handwriting Recognition, Dysgraphia, Machine Learning, Assistive Technology, AI Framework

# NATURAL LANGUAGE PROCESSING FOR THREAT INTELLIGENCE

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**Abstract:** In cybersecurity today, NLP has emerged as a principal weapon for threat intelligence, used to detect, analyze, and mitigate cybersecurity vulnerabilities efficiently. This research focuses on the role of NLP in cybersecurity. NLP extracts insights from unstructured data sources such as security logs, threat reports, dark web forums, and phishing emails. It facilitates real-time detection of malicious activities, attack propagation, and vulnerabilities. By determining key parameters like attack type, source, destination, and affected devices, NLP structures observations into actionable reports for data fortification. NLP-controlled automation enhances incident response with AI-powered chatbots and virtual assistants, reducing the load on cybersecurity professionals and improving response times. Additionally, NLP summarizes security events and generates structured threat intelligence reports for decision-making. When integrated with machine learning and graph-based threat intelligence, NLP strengthens anomaly detection and counters sophisticated cyberattacks. This paper highlights the importance of continuous innovation, compliant regulations, and industry collaboration in adopting NLP for threat intelligence, reinforcing a robust cybersecurity ecosystem

**Keywords:** Natural Language Processing, Threat Intelligence, Cybersecurity, Incident Response, Machine Learning

# OPTIMISING AGRICULTURAL PRODUCTION

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**Abstract:** In order to meet the rising global food demand brought on by population growth, agricultural production must increase. Temperature is a major factor in the region's agricultural output because it has a direct impact on plant growth and development. This study investigates the use of city temperature data obtained through an API to suggest the optimal crops for farming techniques. By combining agricultural expertise with real-time temperature data, this technology provides recommendations for selecting the best crop seeds based on environmental conditions. The primary focus will be on locating the seeds with the classifications "K," "P," or "Na" that are best suited for various temperature ranges in order to assist farmers in making decisions that will maximize productivity and sustainability.

**Keywords:** Agriculture, Temperature Data, Crop Optimization, Sustainable Farming, API Integration

# ROOFTOP SOLAR POTENTIAL MAPPING SYSTEM

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**Abstract:** This study introduces an innovative method for precisely assessing rooftop solar potential by combining machine learning algorithms with high-definition satellite images and solar radiation information. Conventional approaches frequently experience inaccuracies in extracting building footprints, resulting in mistakes when calculating rooftop areas for photovoltaic (PV) installation. To tackle this issue, we created and executed a tailored semantic segmentation model utilizing the U-Net architecture, which surpassed current models like YOLOv8 in defining building edges. By utilizing the obtained building footprints, we computed rooftop areas with high spatial accuracy and combined this information with solar radiation metrics from SolarGIS, encompassing Photovoltaic Electricity Potential, Global Horizontal Irradiation, and Direct Normal Irradiation. Our findings indicated an enhancement in the accuracy of estimating rooftop solar potential, offering a more dependable structure for evaluating solar energy viability across various areas. This method provides useful perspectives for urban planners, legislators, and solar energy developers, supporting data-informed choices for sustainable urban energy changes. Future efforts will aim at broadening the model's relevance to various geographic areas and integrating real-time data to improve prediction precision.

**Keywords:** semantic segmentation, U-Net architecture, extraction of building footprints, solar radiation analysis, estimation of photovoltaic potential

# TUNE MUSIC APP: AI-DRIVEN MUSIC STREAMING PLATFORM

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**Abstract:** The Tune Music App is an AI-powered music streaming platform designed to deliver personalized recommendations and an enhanced user experience. The app is built using HTML, CSS, and JavaScript for both the front end and backend, with Node.js running the server on localhost. MongoDB handles user authentication and authorization, securely storing login credentials. The platform integrates a Google Gemini chatbot to suggest music based on user preferences, making recommendations more relevant and engaging. It offers real-time lyrics synchronization, allowing users to follow along seamlessly. The app also features ad-free streaming and displays the top six Spotify playlists, which are updated weekly with the latest hits and trends across various music genres. This combination of AI-driven recommendations, real-time lyrics, and weekly curated playlists offers a unique, uninterrupted listening experience. The project aims to redefine music accessibility and user engagement through AI innovation and dynamic content updates.

**Keywords:** Music streaming, AI Recommendations, Real-Time lyrics, Spotify Playlists, Ad-Free Playback

# ABSTRACTS

## DEPARTMENT OF ECE

# A DEEP NEURAL NETWORK FOR ANALYSIS OF MULTI-CLASS CLASSIFICATION OF MICROSCOPIC BLOOD CELL IMAGES

Subhojit Sarkar, Duvvuru Charan Teja Reddy, Shubhra Dixit

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**Abstract:** The classification of blood cells is crucial for the timely diagnosis and monitoring of hematological disorders, including infections, immune dysfunctions, and malignancies such as leukemia. Traditionally, this process involves manual analysis of blood smear images by hematologists, which is effective but time-consuming and prone to variability and human error. With advancements in artificial intelligence, deep learning offers promising solutions for automating and enhancing diagnostic accuracy in medical imaging. This study explores the Vision Transformer (ViT-L/16), an advanced deep learning model originally designed for natural language processing and adapted for image classification. Unlike convolutional neural networks (CNNs), which use localized filters, ViTs process image patches as sequences, capturing global context and long-range dependencies. We use a ViT-L/16 model pretrained on ImageNet-21k and further fine-tuned on a specialized dataset of 17,092 microscopic blood cell images from the Clinical Hospital of Barcelona. The dataset includes eight blood cell classes and was pre-processed through resizing, normalization, and augmentation. The ViT-L/16 model achieved a classification accuracy of 98.95%, outperforming leading CNNs such as VGG, ResNet, and EfficientNet. These results demonstrate the potential of transformer-based models in medical diagnostics and suggest promising directions for future research, including model generalization and clinical integration.

**Keywords:** Vision Transformer (ViT), Blood Cell Classification, Microscopic images, Deep learning

# DESIGN & DEVELOPMENT OF AN AUTONOMOUS SPIDER ROBOT FOR WATER DETECTION AND CLOUD- BASED LOCATION REPORTING IN DESERT AREA

Samridhi Bhardwaj, Aarushi Gupta, Richa Sharma

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**Abstract:** This research paper outlines the design and development of an autonomous spider robot for water detection and cloud-based location reporting in desert areas. The robot is engineered to autonomously traverse the difficult terrains of the barren region, using an advanced array of sensors along with LiDAR, infrared cameras, and moisture sensors. The incorporation of artificial intelligence algorithms empowers the robot to method sensor facts in actual time, thereby facilitating self-sufficient decision-making tactics concerning the choice of foremost paths and the prioritization of areas for further investigation, primarily based on the chance of water detection. The records accumulated are transmitted in actual-time to a cloud-based platform, which helps in remote tracking, real-time visualization, and evaluation. The design of the spider robot locations a high emphasis on mobility and flexibility, presenting multiple legs for stability on choppy terrains and a lightweight, robust structure to endure the tough situations of the wasteland.

**Keywords:** Autonomous spider robot, CAD design, Water detection, Cloud location reporting, Sensors

# DESIGN AND DEVELOPMENT OF AUTONOMOUS UNMANNED GROUND VEHICLE (UGV) FOR ENHANCED AGRICULTURAL E CIENCY

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**Abstract:** The classification of blood cells is crucial for the timely diagnosis and monitoring of hematological disorders, including infections, immune dysfunctions, and malignancies such as leukemia. Traditionally, this process involves manual analysis of blood smear images by hematologists, which is effective but time-consuming and prone to variability and human error. With advancements in artificial intelligence, deep learning offers promising solutions for automating and enhancing diagnostic accuracy in medical imaging. This study explores the Vision Transformer (ViT-L/16), an advanced deep learning model originally designed for natural language processing and adapted for image classification. Unlike convolutional neural networks (CNNs), which use localized filters, ViTs process image patches as sequences, capturing global context and long-range dependencies. We use a ViT-L/16 model pretrained on ImageNet-21k and further fine-tuned on a specialized dataset of 17,092 microscopic blood cell images from the Clinical Hospital of Barcelona. The dataset includes eight blood cell classes and was pre-processed through resizing, normalization, and augmentation. The ViT-L/16 model achieved a classification accuracy of 98.95%, outperforming leading CNNs such as VGG, ResNet, and EfficientNet. These results demonstrate the potential of transformer-based models in medical diagnostics and suggest promising directions for future research, including model generalization and clinical integration.

**Keywords:** Vision Transformer (ViT), Blood Cell Classification, Microscopic images, Deep learning

# DESIGN AND DEVELOPMENT OF LORA-BASED IOT SETUP FOR ANALYZING IMPACT OF DEEP BREATHING ON STRESS LEVEL

Jiya Choudhary, Mayank Dubey, Richa Sharma

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**Abstract:** An IoT based stress monitoring system has been designed and its performance has been evaluated by monitoring stress level of 25 subjects before and after performing slow breathing exercises for 20 minutes. The proposed system is comprised of heart rate variability (HRV), galvanic skin response (GSR) and temperature Sensor interfaced with ESP32 microcontroller and a LoRa module. HRV and GSR sensor have been calibrated by using a controlled stress inducing environment. This data, which has been obtained by relaxation and stress provoking tasks has been used as a baseline threshold for detecting stress. The proposed system will measure physiological signals indicative of stress levels and using long range LoRa communication protocol send it to IoT analytics platform- ThingSpeak for data analysis and visualization. The designed setup will provide real time data for personal stress monitoring and will help us to visualize the effect of breathing exercises on stress on ThingSpeak.

**Keywords:** LoRa, IoT, stress monitoring, Deep Breathing, heart rate variability, wireless transmission

# DESIGN AND FPGA IMPLEMENTATION OF I2C PROTOCOL AND IT'S UVM VERIFICATION USING HDL

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**Abstract:** This work presents FPGA implementation, and UVM-based verification of the Inter-Integrated Circuit (I2C) protocol using Hardware Description Language (HDL). I2C is a two-wire serial communication standard used for interfacing low-speed peripherals with microcontrollers. The goal is to develop an I2C Master-Slave system in Verilog, implement it on FPGA boards, and validate its functionality through a reusable Universal Methodology (UVM) testbench. The design incorporates essential protocol features such as start and stop conditions, address and data transfer, and acknowledgment signaling. To evaluate hardware efficiency, the I2C design is synthesized and deployed on various FPGA platforms, and a comparative power analysis is conducted to highlight the trade-offs between different architectures. The UVM environment includes sequencers, drivers, monitors, and a scoreboard to ensure functional correctness and increase verification coverage. By combining protocol modeling, FPGA deployment, and systematic verification, this work delivers a comprehensive approach to real-time digital communication system design. It serves as a strong foundation for understanding hardware-software co-design and low-power communication in the VLSI domain.

**Keywords:** I2C Protocol, FPGA, UVM, Master-slave, Verilog

# DESIGN AND VERIFICATION OF SRAM USING HDL AND UVM METHODOLOGY, WITH IMPLEMENTATION ON FPGA

Dhwani Jain, Kavya Panu, Nikhil Kumar, Pradeep Kumar

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**Abstract:** This project focuses on the design, verification, and optimization of SRAM (Static Random-Access Memory) using Verilog HDL, UVM (Universal Verification Methodology), and FPGA technology. SRAM is a critical component in high-speed computing and embedded systems, requiring efficient performance and high reliability. The objective is to develop a robust UVM-based testbench to validate SRAM functionality, ensuring comprehensive, coverage-driven verification of read/write operations, address decoding, and memory stability. To enhance performance, power optimization techniques are implemented, reducing dynamic power consumption while maintaining access speed. SystemVerilog assertions and functional coverage metrics are used to confirm design correctness and ensure compliance with performance benchmarks. Simulations are conducted using Vivado, analyzing timing, power, and area efficiency. The results indicate significant reductions in power consumption and improved access times, making the design well-suited for high-performance embedded applications. This project provides valuable insights into SRAM efficiency improvements, contributing to advancements in low-power memory architectures for next-generation digital systems.

**Keywords:** SRAM, FPGA, UVM, Verilog, Coverage

# FPGA IMPLEMENTATION OF REAL-TIME CHESS POSITION EVALUATION USING DEEP LEARNING

Anubhav Gautam, Kalyani Paul, Anu Mehra

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**Abstract:** This work focuses on the real-time evaluation of chess positions using deep learning, implemented on an FPGA. The neural network model is trained on a dataset of chess positions to assess board evaluation efficiently. A portion of the trained model is deployed on FPGA hardware, utilizing Verilog for implementation and Python for training. The system processes input chess positions transmitted from a host PC to the FPGA, generating evaluations in real time. The integration of hardware-based deep learning enhances computational efficiency compared to conventional CPU/GPU approaches. The project involves data preprocessing, model training, Verilog-based network implementation, and FPGA deployment. Vivado Design Suite is used to synthesize, implement, and program the neural network model onto the FPGA. Testing and validation are carried out by comparing the system's evaluations with those of established chess engines, ensuring reliability and accuracy. This FPGA-based solution demonstrates the potential of hardware acceleration for real-time decision-making in chess and opens pathways for similar AI-driven embedded applications.

**Keywords:** FPGA, Deep Learning, Chess Evaluation, Neural Network, Verilog.

# IOT ENABLED SIGN LANGUAGE TO SPEECH CONVERTER FOR ENHANCED COMMUNICATION

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**Abstract:** In ancient times, the sign language system was developed to eradicate the problem in dumb and deaf people and make them gain knowledge for proper interaction with the world. Learning sign language involved creating sign language using fingers movement and movement in hand. It is being observed that dumb and deaf people feel inferior to society and do not interact much with other people. We got an idea to design and develop user-friendly, cost-effective learning aid for Dumb and deaf children. The project aims to design a learning aid for the Dumb and deaf people in English language which infuses a sense of playing while learning. The proposed idea is implemented on an Arduino Microcontroller interfaced with LCD, Gyroscope and mobile device as output devices. The proposed model develops a glove that can Convert sign language to human voice, and which can be understandable by us, and this will build the bridge between us and make Dumb and Deaf people a part of our society and which can make better for mankind. The biggest challenge is to reduce the cost as much as possible and make things more available for society.

**Keywords:** Sign language system, Gyroscope, Arduino Microcontroller, Voice, Dumb and deaf

# DEVELOPMENT OF LEARNING-BASED CONTROLLER FOR DYNAMIC BALANCING BIPEDAL ROBOT VIA PERIODIC REWARD COMPOSITION

Yogesh Giri, Ojasvi Tak, Sindhu Hak Gupta

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**Abstract:** A reinforcement learning-based control system has been designed and its performance has been evaluated by training a bipedal robot in a MuJoCo-based physics simulation environment. The proposed system comprises a Recurrent Proximal Policy Optimization (Recurrent PPO) algorithm integrated with phase-based motion regulation, proprioceptive feedback, and balance correction strategies. The robot is trained to maintain balance and follow velocity commands by dynamically adjusting its posture and stepping motion. Reward functions have been refined using periodic reward composition to enhance robustness against environmental disturbances. The collected training data has been used as a baseline for dynamic adjustment and adaptive gait generation. The trained control policies will be deployed for real-world applications such as humanoid robotics, assistive exoskeletons, and autonomous legged systems. The designed setup will provide real-time validation of dynamic balancing strategies and contribute towards bridging the gap between simulation and real-world walking behaviors.

**Keywords:** Bipedal Robot, Reinforcement Learning, Dynamic Balancing, Recurrent PPO, MuJoCo Simulation

# DEVELOPMENT OF IOT BASED FRUIT CONDITION MONITORING SYSTEM

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**Abstract:** Fruit ripening is a process caused by a naturally occurring plant hormone, ethylene. Unripe fruits have low concentrations of ethylene and the concentration increases as the fruit ripens. Over-ripening causes the fruit to spoil and is caused by the higher concentrations of the gas. It leads to a shorter shelf life and reduced market value. Fruit ripening is slowed down by refrigerated storage and transportation. This work aims to develop an IoT based monitoring system that can determine the fruit quality in real-time. Gas sensors MQ5 (for detecting natural gas) and MQ3 (for detecting alcohols) have been used to develop this system. Data is transmitted via wireless mediums and the end user can access the results remotely using a mobile or computer. The system is designed to be low-cost and easy to use. The use of WiFi enabled IoT node allows data to be processed and stored on the cloud.

**Keywords:** Fruit monitoring, gas sensors, ethylene gas, fruit ripening, fruit preservation

# WIFI ENABLED AUTONOMOUS HUMAN FOLLOWING TROLLEY WITH LOAD DETECTION

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**Abstract:** This work presents the development of an autonomous human-tracking trolley for logistics applications, particularly in airports. The system utilizes. WiFi signal strength mapping to follow a designated operator, employing unique identification to ensure precise tracking in crowded environments. Equipped with ultrasonic sensors for real-time person tracking and Bluetooth-enabled remote control for manual operation, the trolley maintains optimal distance and adapts to changes in the operator's speed. From the obtained results for the proposed Wi-Fi enabled autonomous human follower trolley, in the presence of obstacles the real time RSSI value of -60 dBm is determined at a distance of 6 meters and -67 dBm at operator distance of 6.2 meters. Therefore, the distance of 5-5.5 m from operator is optimum for use of the proposed system in real time. Furthermore, the option of Bluetooth technology is also provided along with WiFi based autonomous human following trolley which enables the operator to override autonomous functions during more confining spaces where RSSI level is weak. The proposed system also measures the load on the trolley using load cell and alert the user for overload on the trolley that is important for carrier load management.

**Keywords:** Autonomous systems, Bluetooth, Human-tracking trolley, RSSI, Unique identification, WiFi

# THE UPGRADATION OF CONTROLLER 802D USED IN THE AUTOMOBILE INDUSTRY TO OVERCOME THE LIMITS OF PRODUCTION, MAXIMIZE CAPABILITY, AND INCREASE AVERAGE PRODUCTIVITY

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**Abstract:** This project explores the upgradation of the Siemens 802D CNC controller to the more advanced 808D model in the automobile manufacturing industry. The objective is to overcome production limitations, enhance system capability, and increase average productivity through improved automation. The study involves evaluating compatibility with existing CNC machines and robotic systems, developing a prototype using the 808D controller, and establishing measurable performance criteria. Results show that the 808D faster processing, higher machining precision (±3 μm), reduced response time, and improved energy efficiency. The upgraded system also supports advanced interfacing, real-time diagnostics, and seamless integration with Industry 4.0 infrastructure. A comprehensive evaluation framework highlights up to 75% improvement in accuracy and 27% reduction in energy use. The findings confirm that the 808D controller significantly enhances manufacturing efficiency and reliability, making it a strategic upgrade for modern automotive production lines aiming for higher throughput and sustainable operations.

**Keywords:** 802D CNC Controller, Production, Accuracy, Improvement

# DEEP LEARNING BASED APPROACH FOR CARDIAC MRI ANALYSIS

Dhruv Raj Iyer, Laksh Wadhwa, Dhairya Nagpal, Anupama Bhan

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**Abstract:** The segmentation of the right ventricle (RV) from cardiac magnetic resonance imaging (MRI) is a critical step in diagnosing cardiac conditions such as pulmonary hypertension, coronary heart disease, and cardiomyopathies. Despite its importance, manual segmentation remains time intensive and prone to variability, while automated segmentation faces challenges due to the RV's complex anatomy and indistinct boundaries. This paper presents a novel U²Net-based and Dilated U-Net framework for accurate and efficient RV segmentation, leveraging nested residual U-blocks and a hierarchical encoder-decoder structure and attention mechanism with multi-scale feature fusion. The dataset utilized is the Right Ventricle Segmentation Challenge (RVSC), which includes MRI scans of 48 patients. The proposed architecture achieves state-of-the-art performance with a Dice coefficient of 0.86 and a Hausdorff distance of 3.8 mm for U²Net, and 0.9147, 5.21mm for Attention Dilated U-Net respectively surpassing traditional methods in segmentation accuracy and boundary precision. These results demonstrate the potential of deep learning models in achieving clinical-grade segmentation, offering a robust solution for automated RV analysis in diverse clinical scenarios.

**Keywords:** MRI, Residual Network, Deep Learning, Right Ventricle

# ABSTRACTS

## DEPARTMENT OF AI

# ARTIFICIAL INTELLIGENCE BASED BIOMEDICAL SIGNAL PROCESSING & CONTROL

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**Abstract:** Mental fatigue severely affects cognitive performance, decision-making, and productivity. As modern tasks grow more demanding, accurate detection of fatigue is increasingly essential. Traditional machine learning struggles with the complex temporal patterns in biosignals like EEG, EDA, BVP, HR, and body temperature. To address this, we propose a deep learning approach using a hybrid CNN-LSTM architecture. This study builds a robust multimodal model to classify mental fatigue and predict the Chalder Fatigue Score using the MEFAR dataset. We explore multi-task learning and attention mechanisms to improve accuracy and interpretability. By tackling challenges like temporal dependencies and feature relevance, our work contributes a clinically useful tool for real-time mental fatigue assessment.

**Keywords:** Biomedical, EEG, EDA, BVP, HR, CNN-LSTM

# COMPARISON OF CNN AND VISION TRANSFORMERS FOR WILDFIRE DETECTION: A PROXY FOR STUBBLE BURNING

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**Abstract:** Stubble burning is a widely used agricultural practice in India and several other countries that greatly contribute to heavy air pollution. It is done to clear crop residues, usually from April to May and October to November. The gases released during this practice, including particulate matter and greenhouse gases, pose serious health and environmental risks [5]. This research focuses on classifying wildfire burning using satellite imagery as a proxy for stubble burning. We employ deep learning approaches like Convolutional Neural Networks and Vision Transformers to analyze their accuracy, computational efficiency, and real time suitability for environmental monitoring and potentially reduce wildfire burning's impact on air quality.

**Key Words:** Stubble Burning, Wildfire Detection, Air Qual- ity, Deep Learning, Convolutional Neural Networks (CNN), Vision Transformers (ViT), Image Classification, Environmental Monitoring, Satellite Imagery, Real-time Monitoring.

# EXPLORING THE POTENTIAL OF LIGHTWEIGHT LARGE LANGUAGE MODELS FOR AI-BASED MENTAL HEALTH COUNSELLING TASK: A NOVEL COMPARATIVE STUDY

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**Abstract:** In recent years, Transformer-based large language models (LLMs) have significantly improved upon their text generation capability. Mental health is a serious concern that can be addressed using LLM-based automated mental health counsellors. These systems can provide empathetic responses to individuals in need while considering the negative beliefs, stigma, and taboos associated with mental health issues. Considering the large size of these LLMs makes it difficult to deploy these automated counsellors on low cost/resource devices such as edge devices. Therefore, the motivation of the present study to analyse the effectiveness of lightweight LLMs in the development of automated mental health counselling systems. In this study, lightweight open source LLMs such as Google's T5s (small variant), BARTB (base variant), FLAN-T5s (small variant), and Microsoft's GODELB (base variant) have been fine-tuned for automated mental health counselling task utilizing diverse set of datasets publicly available online. The experimental results reveal that BART's base variant outperformed the other models across all key metrics such as ROUGE-1, ROUGE-2, ROUGE-L, and BLEU with scores of 0.4727, 0.2665, 0.3554, and 25.3993 respectively. In comparison to other models, BART-base model generated empathetic, and emotionally supportive responses. These findings highlight the potential of lightweight LLMs (small size LLMs), in advancing the field of LLM-based mental health counselling solutions and underscore the need for exploration of lightweight LLMs for this mental health counselling use case.

**Keywords:** LLM, BARTB, FLAN-T5s, GODELB

# HANDCRAFTED AI: DESIGNING VIRTUAL HARDWARE FOR HAND GESTURE- BASED INTERACTION

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**Abstract:** Hand Gesture Recognition (HGR) enables natural and contactless interaction between humans and machines. This project presents a real-time HGR system using computer vision and machine learning to replace traditional hardware with gesture-controlled virtual devices like a mouse, keyboard, and calculator. Leveraging technologies like OpenCV, Mediapipe, and PyAuto GUI, the system enhances hygiene, accessibility, and user experience, especially in post-pandemic environments. Challenges like lighting variation and background complexity are addressed, making the system practical for diverse applications including education, healthcare, and IoT-based control

**Keywords:** HGR, Mediapipe, PyAuto GUI,

# INTELLIGENT OBJECT DETECTION USING SAR IMAGING FOR SURVEILLANCE IN DEFENCE : A MOBILEVIT APPROACH

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**Abstract:** Synthetic Aperture Radar (SAR) imaging plays a crucial role in defence surveillance due to its all-weather, day-night imaging capabilities. Traditional Convolutional Neural Networks (CNNs) like ResNet-18 and VGG16 have been widely used for SAR target detection, but they struggle with long-range dependencies and computational efficiency. This paper proposes a pure MobileViT-based approach for SAR object detection using the MSTAR dataset, leveraging the strengths of Vision Transformers (ViTs) while maintaining computational efficiency. We compare MobileViT with CNN-based models (ResNet-18 and VGG16) in terms of accuracy, model size, and inference speed. Experimental results demonstrate that MobileViT achieves superior performance with fewer parameters, making it suitable for real-time defence applications.

**Keywords:** SAR , MobileViT, ResNet-18, VGG16

# LATENCY-SENSITIVE CACHING-ASSISTED OFFLOADING IN DIGITAL TWIN- ENABLED IOV USING QUANTUM PARTICLE SWARM OPTIMIZATION

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**Abstract:** With the continuous growth of sixth generation (6G) networks, the Digital Twin (DT) paradigm has emerged as a critical technology for controlling the fast-developing Internet of Vehicles (IoV). Vehicles with high mobility and complicated applications require low latency and efficient system throughput. In this study, we present a Quantum Particle Swarm Optimization (QPSO) approach to solve the Latency-Aware Caching-Aided Offloading Problem (LCAOP) in a DT-enabled IoV system. The QPSO algorithm optimizes job allocation and offloading techniques between cars, roadside units (RSUs), and the cloud to reduce total system latency, increase throughput, minimize age of information, and optimize energy consumption. Extensive simulations demonstrate that the QPSO-based technique decreases latency, improves throughput, enhances information freshness, and reduces energy consumption while beating other classic evolutionary algorithms.

**Keywords:** 6G, Digital Twin (DT), Internet of Vehicles (IoV), QPSO, LCAOP

# LEGAL MIND

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**Abstract:** LegalMind is an AI-powered chatbot designed to provide quick and accessible information on the Indian Penal Code (IPC). It empowers users—students, professionals, and citizens—by offering clear explanations of legal sections, offenses, and punishments through a conversational interface. Built using Langflow, the system integrates structured IPC data, semantic vector embeddings, and OpenAI's language model to deliver fast, accurate answers. Users can ask questions using keywords, section numbers, or natural language, and receive relevant legal context instantly. LegalMind addresses the issue of unreported or misunderstood crimes caused by lack of legal awareness, making justice more approachable and knowledge more inclusive.

**Keywords:** LegalMind , IPC, Legal Sections, Natural Language.

# MARKET PROPHET: HOTSPOT ANALYSIS FOR BUSINESS EXPANSION

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**Abstract:** The restaurant industry is highly competitive, and selecting an optimal location for new outlets is a significant factor in determining the success or failure of a business. Traditional methods like surveys and feasibility studies can be time-consuming and often lack precision. However, the rise of machine learning and data-driven models now offers a faster and more accurate approach. In this study, we present a model-driven solution to predict restaurant success rates using data from the Zomato platform. Our approach focuses on engineered features such as location clustering, competition density, and consumer feedback analysis to determine the best locations for new restaurant openings. The proposed system leverages Random Forest, Gradient Boosting, and XGBoost to compare and determine the most effective method for prediction

**Keywords:** Random Forest, Gradient Boosting, XGBoost.

# MEDICAL IMAGE SYNTHESIS

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**Abstract:** This study addresses the challenge of limited medical imaging data by proposing a novel approach that combines Stable Diffusion with Low-Rank Adaptation (LoRA) to generate synthetic brain MRI scans for Alzheimer's disease research. We fine-tuned the stabilityai/stable-diffusion-2-1 model using LoRA, which enables efficient adaptation of large-scale models by modifying only a small subset of parameters while preserving the pre-trained knowledge. The model was trained on brain MRI scans of 128×128 resolution over 5000 steps with minimal computational overhead. Our approach leverages latent diffusion models that operate in a compressed representation space to maintain computational efficiency while preserving image quality. Quantitative evaluation using Kernel Inception Distance (KID) and Learned Perceptual Image Patch Similarity (LPIPS) metrics yielded scores of 0.135 and 0.398 respectively, indicating that the generated images share statistical properties and structural characteristics with real MRI scans. This work demonstrates the potential of diffusion models for high-quality medical image synthesis while addressing privacy concerns associated with real patient data, paving the way for improved diagnostic models and neurological disorder research without requiring access to sensitive medical records.

**Keywords:** LoRA, MRI, Alzheimer, KID, LPIPS

# MULTI-CLASS IMAGE CLASSIFICATION OF FOOD RECOGNITION AND NUTRITIONAL ANALYSIS USING DNN

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**Abstract:** Precise food identification and nutritional assessment are essential for dietary management and health surveillance. This research introduces a multi-class classification method for food recognition using a deep neural network (DNN) and the Food101 dataset. Advanced convolutional neural network (CNN) architectures, such as InceptionResNetV2, Xception, and NASNet Mobile, are utilized to extract tricky spatial characteristics from food photos. A hybrid model combining Xception and NASNet Mobile is proposed to improve class accuracy through making use of their complimentary characteristic extraction abilties. Overall performance assessment is finished using accuracy, precision, remember, and F1-score measurements. The highest quality model, Xception + NASNet Mobile, attains an accuracy of seventy-four %, indicating fantastic generalization and resilience in meals category. The findings underscore the efficacy of deep feature fusion in improving class performance, exceeding that of separate version architectures. The results decorate automated nutritional evaluation, facilitating correct meals identification for dietary tracking and health applications. The advised approach improves the dependability of food class systems, permitting clean incorporation into realistic nutritional management systems.

**Keywords:** DNN, CNN, Food101, Xception, NASNet Mobile

# MULTI HEAD SELF-ATTENTION BI LSTM MODEL FOR EFFECTIVE GYM EXERCISE RECOGNITION

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**Abstract:** Accurate posture recognition plays a crucial role in fitness training and rehabilitation, ensuring proper form, reducing injury risk, and optimizing workout effectiveness. This study introduces a Multi-Head Stacked Bi-LSTM architecture for IMU-based gym exercise recognition, designed to handle challenges such as sensor orientation variability and movement complexity. The proposed model processes multi-axis sensor data from accelerometers, gyroscopes, and magnetometers, collected using Apple's CoreMotion SDK across 10 gym exercises. The multi-head mechanism enables independent learning from different rotational perspectives, while stacked Bi-LSTM layers capture intricate spatial and temporal dependencies. Aggregating features from multiple rotations significantly improves classification accuracy. Experimental results demonstrate that the model achieves 94.44% accuracy and F1-score, outperforming traditional CNN+LSTM and Bi-LSTM approaches. This research highlights the potential of AI-driven posture correction for real-time fitness monitoring and rehabilitation applications. Future advancements could integrate EMG sensors and vision-based systems to enhance movement analysis and provide personalized feedback.

**Key Words:** CNN+LSTM, Bi-LSTM, AI

# MULTI-CLASS MEDICINAL PLANT LEAF CLASSIFICATION RECOGNITION AND RECOMMENDATION

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**Abstract:** This project develops an automated system for classifying medicinal leaves from different species using DNNs and providing medicinal recommendations based on the classification. CNNs are used to process images of leaves, identifying species by detecting unique features. The model was trained on a varied dataset of labeled medicinal plant leaves, achieving high accuracy in species identification. Additionally, a recommendation system was incorporated to connect the identified species with their medicinal uses. This work enhances the process of medicinal plant identification, offering a scalable and automated solution that can be expanded with more data and used in healthcare and research applications.

**Key Words:** DNN, Medicinal Plant, CNN

# RAGING MACHINES: A HYBRID FRAMEWORK FOR SKIN DISEASE DIAGNOSIS AND MEDICAL GUIDANCE

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**Abstract:** This paper proposes a two-stage framework designed to support dermatological decision-making by combining image-based diagnosis with natural language medical guidance. In the first stage, a ViT (Vision Transformer) model is fine-tuned to identify five commonly encountered skin conditions: nail psoriasis, SJS-TEN (Stevens-Johnson Syndrome and Toxic Epidermal Necrolysis), vitiligo, acne, and hyperpigmentation. The ViT model exhibits strong performance in accurately identifying these diseases, benefiting from its domain-specific attention mechanisms and superior generalization across skin tones and imaging artifacts. In the second stage, a Retrieval-Augmented Generation (RAG) model is added to provide clear, human-readable medical explanations based on the model's predictions. This component uses a locally stored medical corpus alongside open-source language models to generate responses. Few LLM models are compared based on response quality, speed, token usage, and alignment with expert-written references using ROUGE scores and cosine similarity. The results highlight the strengths and limitations of each model, offering practical guidance for choosing LLMs in resource-conscious medical applications. Overall, the proposed system brings together accurate image classification and meaningful language support to assist in dermatological care.

**Keywords:** ViT, RAG, LLM, ROUGE

# SMART NAVIGATION SYSTEM FOR THE VISUALLY IMPAIRED USING AI WITH CROWD AND POI AWARENESS

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**Abstract:** Navigating outdoor environments independently remains one of the biggest challenges for individuals with visual impairments. Traditional mobility aids like white canes, guide dogs, and even GPS-based tools often lack the ability to convey real-time information about obstacles, moving people, or sudden changes in the environment. This gap in contextual awareness can seriously impact the user's confidence, safety, and independence—especially in busy or unfamiliar areas. This work presents an extended AI-powered smart navigation system tailored for the visually impaired, building upon our previously developed model. The earlier system, based on YOLOv8, provided object detection, traffic light recognition, and weather alerts. This extended version introduces real-time crowd detection and Point-of-Interest (POI) recommendation using Google Maps API. With seamless text-to-speech integration, users receive live auditory guidance about nearby people's density and food outlets. This system enhances safety, independence, and contextual awareness in dynamic urban environments

**Keywords:** YOLOv8, POI, Google Maps API,

# ABSTRACTS

## DEPARTMENT OF CE

# ADSORPTION OF HEAVY METALS CR6+, PB2+, ZN2+AND NI2+ FROM AQUEOUS SOLUTION BY PEANUT SHELL BIOMASS

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**Abstract:** The study investigates the potential of peanut shell biomass as a low-cost and eco-friendly adsorbent for the removal of heavy metals, including $Zn^{2+}$ , $Pb^{2+}$ , $Cr^{6+}$ , and $Ni^{2+}$ , from aqueous solutions. Various parameters, such as biomass dosage (0.2–4%), initial metal ion concentration (5–50 mg/L), pH (2–5), and contact time, were optimized to achieve maximum adsorption efficiency. The results demonstrate that peanut shell biomass effectively removed 97% $Cr^{6+}$ , 93% $Pb^{2+}$ , 90.7% $Zn^{2+}$ , and 86% $Ni^{2+}$ at an initial metal concentration of 25 mg/L and pH 4. The adsorption process was well described by the Freundlich isotherm model, with correlation coefficients ($R^2$) ranging from 0.9289 to 0.9621 for all metal ions. These findings highlight the significant potential of peanut shell biomass as an efficient and sustainable adsorbent for heavy metal removal, offering a cost-effective solution for wastewater treatment and environmental remediation.

**Keywords:** Heavy metal; Biosorption; Zn2+, Pb2+, Cr6+ and Ni2+, Peanut shell biomass Industrial waste biomass

# COMPARATIVE STUDY OF PLASTIC-ENHANCED CONCRETE CUBE AS SUSTAINABLE BUILDING MATERIALS

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**Abstract:** Harnessing sustainable construction, this study evaluates the partial replacement of natural sand with High-Density Polyethylene (HDPE) plastic waste in M30 concrete. Four replacement levels (5%, 10%, 15%, 20% by weight of sand) were tested, with Fosroc Conplast SP430 G8 admixture to maintain workability. Slump tests measured fresh-state workability, while Ultrasonic Pulse Velocity (UPV) and rebound hammer tests assessed internal integrity and surface hardness. Compressive strength was evaluated at 7 days (70% target) and 28 days (100% target), and impact resistance was also examined. Results show that up to 10% HDPE substitution sustains acceptable workability and strength, with marginal reductions in durability and impact resistance. Beyond 10%, performance declines more markedly. The findings demonstrate that low-level HDPE incorporation can valorize plastic waste, reduce environmental impact, and contribute to sustainable concrete production without significantly compromising mechanical properties.

**Keywords:** Sustainable construction, HDPE Plastic waste, Sand replacement, Compressive strength, Durability

# EARTHQUAKE RESISTANT STRATEGY FOR UNSYMMETRICAL LOW-RISE BUILDING

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**Abstract:** Unsymmetrical low-rise buildings experience amplified torsional responses and stress concentrations during earthquakes due to their irregular mass-stiffness distributions. This study develops and validates a cost-effective seismic-resistant strategy combining strategically placed shear walls, steel bracing systems (X-, K-, Chevron-types), and base-isolation devices, along with symmetric retrofitting to balance dynamic response. A G+3 L-shaped model was analyzed via shake-table experiments and finite-element simulations in ETABS/STAAD.Pro. Results demonstrate a ~40 % reduction in top-floor lateral displacement, a 50 % decrease in torsional irregularity index, increased natural frequency, and enhanced base-shear capacity. These findings confirm that the proposed integrated approach significantly improves lateral stability, minimizes torsion, and boosts energy-dissipation, thereby enhancing safety and resilience in earthquake-prone regions.

**Keywords:** Unsymmetrical building, Seismic retrofit, Shear walls, Steel bracing, Base isolation, torsional irregularity.

# EXAMINING THE ROLE OF BUILDERS AND OCCUPANTS IN CONSTRUCTION TOWARDS SUSTAINABILITY

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**Abstract:** The increasing demand for energy and heavy reliance on non-renewable resources have drawn attention to the environmental damage caused by traditional building designs and construction methods. As a result, sustainability has become a key focus in the construction industry, leading to the emergence of green building practices. However, implementing green building strategies in developing countries like India faces several challenges, including weak regulations, limited government support, technological limitations, and low public awareness. Using a mixed-method approach that combines surveys and expert interviews, this research identifies solutions such as offering government subsidies, creating national green building standards, increasing public awareness, and adopting innovative technologies to promote green construction. By analysing both qualitative and quantitative data, the study highlights the potential of the construction sector to encourages sustainable urban growth and enhance resource efficiency. It addresses the barriers to green building adoption and emphasizes the role of the construction industry in achieving Sustainable Development Goals (SDGs). The study provides practical recommendations for policymakers, industry professionals, and businesses, calling for collective efforts to overcome these obstacles and ensure construction practices align with global sustainability objectives.

**Keywords:** SDGs (Sustainable Development Goals), Construction practices, Barriers, Sustainable Construction, Environmental Impact

# EXPERIMENTAL INVESTIGATION OF MECHANICAL OF FIBER REINFORCED CONCRETE USING RECYCLED FIBER

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**Abstract:** Concrete's low tensile strength and susceptibility to cracking limit its durability in structural applications. This study investigates the efficacy of recycled steel fibers (RSF), sourced from waste rubber-tire steel, as a sustainable reinforcement in M30-grade concrete. RSF was incorporated at volumetric dosages of 1.5 %, 2.25 %, and 3 %, and specimens were tested after 28 days of curing in accordance with relevant IS codes. Compressive, split-tensile, and flexural strength tests reveal that adding RSF significantly enhances load-bearing capacity, ductility, and post-cracking energy absorption. The highest dosage (3 %) yielded the greatest improvements—compressive strength increased by approximately 18 %, flexural strength by 22 %, and split-tensile strength by 20 % compared to plain concrete. Although workability decreased slightly at higher fiber contents, the environmental benefits of repurposing industrial by-products and the cost-effectiveness of RSF make it a promising alternative to conventional reinforcement. Further research should address long-term durability, optimal fiber orientation, and large-scale field performance.

**Keywords:** Recycled Steel Fiber (RSF), Fiber-Reinforced Concrete (FRC), Sustainable Construction, Crack Resistance

# EXPLORING MACHINE LEARNING MODELS FOR PREDICTING COMPRESSIVE STRENGTH OF CONCRETE INCORPORATING CONSTRUCTION AND DEMOLITION WASTE

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**Abstract:** The use of construction and demolition waste (CDW) as a partial replacement for natural aggregates in concrete is gaining attention for its environmental and economic benefits. However, predicting the compressive strength of such recycled concrete remains a challenge due to variability in material properties. This study explores the application of machine learning (ML) models to accurately predict the compressive strength of concrete incorporating CDW, enabling data-driven mix optimization. Various ML algorithms, including Decision Trees, Random Forest, Support Vector Machines, and Artificial Neural Networks, were trained on a dataset containing different mix proportions, curing periods, and material compositions. Model performance was evaluated using statistical metrics such as mean absolute error (MAE), root mean square error (RMSE), and R-squared ($R^2$). Results indicate that ensemble learning models, particularly Random Forest, achieved superior accuracy compared to traditional regression methods. This study demonstrates the potential of ML in optimizing concrete mix designs, reducing material waste, and promoting sustainable construction practices.

**Keywords:** Machine Learning, Compressive Strength, Concrete, Construction and Demolition Waste, Sustainability.

# INTEGRATED FRAMEWORK OF DIGITAL TWIN AND BIM FOR ENHANCED INFRASTRUCTURE MONITORING

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**Abstract:** Infrastructure monitoring plays a crucial role in ensuring safety, optimizing operations, and enabling proactive maintenance. This project integrates Digital Twin and Building Information Modeling (BIM) to enhance infrastructure monitoring by creating a real-time, data-driven framework. By assigning attributes to 3D BIM models and incorporating sensor data, a virtual representation of the infrastructure is developed for improved management and predictive analysis. The framework is scalable and applicable to various domains, facilitating efficient monitoring and decision-making. Implemented in a concrete lab environment, this research leverages advanced digital techniques to enhance sustainability, operational efficiency, and remote accessibility, paving the way for smarter infrastructure management

**Keywords:** Digital Twin, BIM, Infrastructure Monitoring, Real-time Data, Predictive Analysis

# SOIL STABILIZATION BY USING LIME, FLY ASH & FIBER

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**Abstract:** Soil stabilization is a crucial aspect of geotechnical engineering, aimed at enhancing the strength and durability of soil for construction purposes. Recent studies have explored the effectiveness of various stabilizing agents, including chemical additives and natural fibers. This study focuses on the stabilization of soil using a combination of jute fiber, lime, and fly ash. Jute fiber, a biodegradable and sustainable material, is integrated with fly ash and lime to improve soil properties, such as load-bearing capacity and resistance to deformation.The primary objective of this research is to investigate the impact of jute fiber in conjunction with fly ash and lime on soil strength and stability. California Bearing Ratio (CBR) and Standard Proctor Test (SPT) experiments are conducted on soil samples prepared at their maximum dry density and optimum moisture content. The soil samples are mixed with varying percentages of fly ash (5%, 10%, 15%, and 20%), lime, and jute fiber to analyze their combined effects. The study evaluates how the addition of jute fiber enhances cohesion, reduces brittleness, and improves the overall performance of stabilized soil compared to conventional methods. The results highlight the potential of using jute fiber as an eco-friendly reinforcement that complements the chemical stabilization properties of fly ash and lime. The findings suggest that this method can provide a cost-effective and sustainable solution for foundation and roadway

**Keywords:** SDGs (Sustainable Development Goals), Construction practices, Barriers, Sustainable

# ABSTRACTS

DEPARTMENT OF ME

# A YOLO DRIVEN AUTOMATED PV HEALTH MONITORING CLEANING SYSTEM WITH COMBINED IOT SENSOR FUSION

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**Abstract:** The PV solar energy development has already emerged as both framework and keystone to sustainable development in 21st century which is being offered as a boon for a clean pathway of renewable sustainable source amid mounting climate change concerns. With rapid advancement in solar panel efficiency and declining product cost and its widespread adoption in developing nations, its pivotal role in shaping the global economy with transition to low carbon economy changed drastically. However, with the present scenario of rapid climate change and rising global energy demand concerns are being raised regarding the efficiency of solar panels and susceptibility to major factors of environment including dust accumulation, humidity, temperature fluctuation and reduced light intensity. In view of the prevailing condition and present circumstance with alignment to global current trend the following research paper presents and exhibits a novel solution of real time intelligent automated system of PV panel health monitoring and automated cleaning utilizing multimodal data fusion algorithms with embedded IOT control architecture. The proposed solution exhibits panel dirt detection and cleaning system as smart solution towards panel efficiency optimal maintenance through automated monitoring. The following system sites and classifies panel cleanliness in two categories namely clean and dirty using lightweight (YOLOv5) model with a webcam feed as aid for capturing and feeding visual input. As complementary to this scenario sensor data with embedded Arduino architecture is being captured with increased reliability and both former and latter data is being fused via Large Language model (LLM) to improve prediction. By this current approach of fusing visual data with sensor input, the system accurately determines when a panel is dirty or not. Upon detection, it alerts the user and can automatically trigger a cleaning mechanism via a relay module. By minimizing manual inspection and mitigating energy loss concerns this method of approach enhances its contribution towards more sustainable solar power systems though timely and intelligent data driven maintenance strategy ultimately promoting sustainable integration at global energy landscape

**Keywords:** Automated Monitoring, Internet of Things (IOT), Dirt- Detection, Multimodal Data Fusion, YOLOv5, Low Carbon Economy, Embedded Systems, Large Language Model (LLM).

# AN INVESTIGATION OF MACHINE LEARNING TECHNIQUES FOR IMPROVED RESERVOIR CHARACTERIZATION

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**Abstract:** Reliable forecasting of reservoir performance relies on precise predictions of porosity and permeability. This study evaluates four machine learning algorithms (Linear Regression, Support Vector Regression, Random Forest, and Artificial Neural Networks) applied to a comprehensive well log dataset sourced from Kansas (USA), covering depths of 195 m to 4,808 m. Following data preprocessing (missing-value handling, outlier detection, normalization) and feature selection (gamma ray, bulk density, resistivity), each model was trained using an 80/20 split and optimized via cross-validation. Model performance was assessed using $R^2$, RMSE, and MAE metrics. Linear Regression provided a clear baseline, capturing general trends with moderate accuracy; SVR's kernel mapping improved non-linear fit; Random Forest's ensemble approach mitigated bias and variance; and the ANN model achieved the highest predictive capability. These findings underscore the transformative potential of machine learning in reservoir characterization—enhancing prediction reliability, reducing uncertainty, and enabling data-driven decision-making in petroleum engineering workflows.

**Keywords:** Reservoir Characterization, Machine Learning, Porosity, Permeability, Well Log Data, Predictive Modelling.

# ARTIFICIAL INTELLIGENCE DRIVEN SUSTAINABLE INNOVATIONS FOR RESILIENT SUPPLY CHAIN

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**Abstract:** The study titled "Artificial Intelligence-Driven Sustainable Innovations for Resilient Supply Chains" explores the transformative potential of artificial intelligence (AI) in fostering sustainability and resilience within supply chain management, with a specific focus on small and medium-sized enterprises (SMEs). Despite its significant benefits, AI adoption in supply chains is hindered by various challenges that require systematic evaluation and resolution. This research employs to the development of a framework for AI-driven sustainable innovations. Drawing on extensive literature reviews and expert consultations, the study highlights critical impediments such as insufficient top management support, resistance to technological change, skill shortages, and concerns over data security. The study's findings provide actionable insights for SMEs in emerging markets, empowering them to harness AI for building resilient and sustainable supply chains in today's dynamic and competitive business landscape.

**Keywords:** Artificial intelligence; Sustainable Innovations, resilient supply chain Small and medium enterprises

# BUILDING MODULAR GPS TRACKER SYSTEM

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**Abstract:** Global Positioning System-based tracking systems play a crucial role in location monitoring and navigation applications. This project presents a modular GPS tracker system designed for adaptability across various tracking needs. The objective is to develop a flexible and efficient tracking device that allows easy integration of additional features based on user requirements. The system consists of a microcontroller, a GSM-GPS module, and supporting electronic components, all assembled in a modular configuration. The hardware and software are designed to enable seamless upgrades and modifications. The firmware is developed to process location data efficiently and transmit it using a wireless communication network. A web-based or mobile interface provides location tracking and status updates. The tracker successfully provides accurate location data with minimal delay under different environmental conditions. By focusing on modularity, this system ensures scalability, easy maintenance, and future feature expansion, making it a cost-effective and adaptable solution for diverse tracking applications.

**Keywords:** GPS, Building Modular

# DEEP LEARNING BASED SURFACE QUALITY MONITORING IN ECO-FRIENDLY AUTOMATED GRINDING '

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**Abstract:** In present automated manufacturing industries, rejection of finished items are the great challenges due to inadequate technologies and discrete surface quality monitoring system. Research aimed to maintain desire surface properties of high strength to weight ratio SiO2 reinforce aluminium composite along with wear resistance, corrosion resistance and heat resistance for engine shield applications in real time. Various contribution set of 1%, 2% and 3% silicon dioxide (SiO2) particles were reinforced with Al6063 matrix and cylindrical rod were fabricated through stir casting at 8000C. Response surface methodology-based design of experiment was implemented to conduct 15 experiments on automated CNC grinding operations under control condition of three critical process parameters like rotational speed (rpm), Feed rate (mm/min.) and Depth of cut (mm). Various kind of CNC grinding abrasive wheels (Al2O3, SiC, cBN and Diamond) were used to conduct total of 225 experiments. Deep learning based cNN modelling has been done using the surface characterization result of scanning electron microscopy (SEM), surface roughness, XRD and High-Resolution Tunneling Electron Microscopy (HRTEM). Raspberry Pi based optical vision trained model has been developed for real time surface monitoring.

**Keywords:** Ceramic Composite, RSM Design of Experiment, CNC Grinding, Surface Characterization, cNN based modeling.

# DESIGN AND ANALYSIS OF 2 - 6 DEGREE OF FREEDOM MOBILE ROBOTIC ARM

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**Abstract:** This project focuses on the design and development of a mobile robotic arm capable of performing pick-and-place operations in constrained spaces. Unlike traditional pick-and-place robots commonly used in large-scale industries, this robotic arm is designed to be compact and mobile, making it suitable for smaller environments. The robot is built on an Arduino Uno platform and incorporates a wireless controller for seamless remote operation. It can move forward, backward, and turn in any direction with precision, enabling it to efficiently transfer heavy or bulky workpieces from one location to another. Additionally, the robot can retrieve objects, making it versatile for various applications. Performance parameters such as speed, load capacity, and operational range have been analysed to ensure reliability and efficiency. This prototype aims to provide an accessible and adaptable solution for tasks requiring mobility and flexibility in industrial and non-industrial settings.

**Keywords:** Mobile Robotic Arm, Small- Scale Industry Automation, Degrees of Freedom, Cost-Effective Robotics, Flexible Manufacturing Systems

# DESIGN AND DEVELOPMENT OF CATALYTIC CONVERTER FOR DIESEL ENGINES USING PHASE CHANGE MATERIALS

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**Abstract:** An exhaust system is a discharge control mechanism for vehicles that transforms the fumes from an ignition motor's burning byproducts into less hazardous compounds through catalyzed compound reactions. To reduce emissions, aluminum oxide and chromium oxide are used in the catalytic converter analysis for the minimization of emissions as much as possible. Polyurethane has been used as a phase change material which plays a pivotal role in adsorbing the heat for a prolonged period and then releasing it which enhances the fuel efficiency of the vehicle, increases the life cycle of the vehicle and it increases its life cycle for a prolonged period. The analysis also aims to determine the impact of the catalytic converter on emissions. The test engine, catalytic converter, AVL exhaust fuel analyzer, temperature gun and other measurement devices make up the experimental setup. The test engine was a four-stroke diesel single-cylinder engine. Initially, the engine was running with the existing catalytic converter with no other addition and the emissions have been analyzed using gas analyzer of AVL. The exhaust emissions, and the design of the catalytic converter was considered as a main challenge where it was observed that heat was being adsorbed and emissions were reduced to around 30-40% in every case possible and oxygen, lambda value increased by 15-20 % which comes out from the exhaust port of the catalytic converter. By working in a similar manner on the newly developed catalytic converter, which will soon be seen in upcoming vehicles with better catalytic converter designs and structures, this research has set the foundation for future work that can be done to achieve minimum heat loss from the catalytic converter using phase change materials.

**Keywords:** AVL, Catalytic Converter

# DESIGN AND FABRICATION OF SOLAR OPERATED MULTI-SIEVE SYSTEM FOR AGRICULTURAL APPLICATIONS

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**Abstract:** Agriculture is the backbone of many rural economies, where efficient post-harvest processing is essential for maximizing productivity and profitability. Sieving is one such process where grains are separated from impurities. Traditional methods of sieving in agriculture are often labour-intensive, time-consuming, and reliant on electricity, which may not be accessible in remote areas. We have designed and fabricated a solar-operated multi-sieve system specifically for agricultural applications, offering a sustainable and cost-effective solution for grain and seed sorting, cleaning, and separation. This work aims to address these challenges by utilizing renewable solar energy to power a multi-sieve system that automates the sieving process. The solar-powered system comprises a set of sieves with varying mesh sizes arranged in layers, driven by a DC motor that operates using solar energy stored in a battery. The solar panel collects and converts sunlight into electricity, making the system independent of external power sources and suitable for regions with unreliable electricity supply. The design allows for efficient separation of grains and seeds based on size, which is critical for ensuring quality control in post-harvest operations.

**Keywords:** Post-harvest Processing, Sieving System, Grains Separation, Solar Operated System

# DEVELOPMENT OF HYDROGEN GENERATION KIT

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**Abstract:** Hydrogen has emerged as a vital component in the transition toward cleaner energy systems, offering a sustainable and efficient alternative to fossil fuels. Among the various hydrogen production techniques, electrolysis of water remains one of the most promising, particularly when integrated with renewable energy sources. This study presents a comprehensive comparative analysis of hydrogen generation through electrolysis, emphasizing the performance of different electrolyte solutions, electrode materials, and catalytic agents. Electrolytes such as sulfuric acid ($H_2SO_4$), potassium hydroxide (KOH), and sodium bicarbonate ($NaHCO_3$) were investigated to assess their ionic conductivity and compatibility with a range of electrodes, including platinum, nickel, stainless steel, and graphite. Additionally, the study incorporates an evaluation of various catalytic materials—such as ruthenium oxide ($RuO_2$), cobalt-based catalysts,—based on their ability to lower overpotential and enhance reaction kinetics during both the hydrogen evolution reaction (HER) and oxygen evolution reaction (OER). Key electrochemical parameters, including current density, overpotential, Faradaic efficiency, and hydrogen output rate, were systematically measured under controlled conditions. The findings indicate that while platinum in acidic media continues to set the benchmark for efficiency, more cost-effective catalysts like cobalt phosphide, when paired with nickel electrodes in alkaline environments, offer a strong balance between performance and scalability. Stability tests also highlighted the durability of certain non-noble catalysts, suggesting their potential for long-term application in industrial electrolysis systems. By exploring the synergistic role of electrolytes, electrodes, and catalysts, this research offers valuable insights into optimizing hydrogen production. Experimental results demonstrate that the use of advanced catalysts such as $RuO_2$, Co-LDH significantly enhances hydrogen generation rates and faradaic efficiency while reducing energy costs, highlighting the critical role of catalyst selection in optimizing electrolysis performance. The outcomes contribute to the broader goal of developing economically viable and environmentally sustainable electrolysis technologies, advancing the role of hydrogen as a cornerstone in the future global energy mix.

**Keywords:** OER, HER, Hydrogen Generation

# EMERGENCY ESCAPE SYSTEM FOR VEHICLES

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**Abstract:** Automobile accidents frequently lead to critical emergencies where passengers struggle to evacuate due to jammed seatbelts, damaged doors, or difficulty in breaking windows. These problems are especially severe during incidents such as vehicle fires or submersion in water, where immediate escape is essential for survival. Panic and disorientation further reduce the chances of successful evacuation, often resulting in fatalities. Research shows that around 14% of vehicle-related deaths occur in situations involving drowning or fire, highlighting the urgent need for accessible and effective emergency escape solutions. This project proposes two integrated safety mechanisms to address these concerns: a Seatbelt Cutting Mechanism and a Window Breaking Mechanism. The seatbelt cutter allows passengers to quickly release themselves from malfunctioning seatbelts, reducing injury risk and escape time. The window breaker offers an alternate exit when doors are jammed, helps emergency responders access the vehicle, and improves ventilation to prevent suffocation and slow fire spread. Together, these mechanisms aim to significantly enhance in-vehicle safety and survival rates during life-threatening automotive emergencies.

**Keywords:** Emergency evacuation; Seatbelt cutting mechanism; Window breaking mechanism; Vehicle safety; Automotive accidents

# EXPERIMENTAL ANALYSIS OF BAMBOO ROOF INCORPORATED WITH PHASE CHANGE MATERIAL FOR THERMAL EFFICIENT BUILDING ENVELOPE

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**Abstract:** Thermal Energy Storage (TES) using phase change material has evolved as one of the sustainable technologies to improve the thermal performance of varieties of thermal systems. One such thermodynamic system is building, where external heat gain creates indoor thermal uncomfort. To improve indoor thermal comfort level phase change material (PCM) are embedded in building envelope to improve its energy storage capacity. Consequently, it will regulate the indoor temperature of the building. In this study, various Light-weight Bamboo Roofs (LBR) were developed using gypsum board, bamboos, thermal paint, PCM, and Polyurethane Foam (PUF) in varying order. All LBRs were then tested for indoor thermal performance under constant heat flux in laboratory condition. Results depicts that LBR-3 shows lowest peak temperature rise in comparison with LBR-0, LBR-1, and LBR-2. LBR-2 shows least thermal amplitude followed by LBR-3, and LBR-1. Also, LBR-1 shows least decrement factor in comparison with all other LBRs.

**Keywords:** Phase Change Material (PCM), Thermal Energy Storage (TES), Buildings

# FABRICATION OF METAL MATRIX COMPOSITES AND ANALYSIS OF THEIR MECHANICAL PROPERTIES

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**Abstract:** The research focuses on the fabrication and characterization of an aluminum metal–matrix composite (ALMMC) based on high-strength Al 7075 alloy, reinforced with $Ti_2$ AlC (MAX phase), Ni–Ti (shape-memory alloy) and graphene. Composites were produced via powder-metallurgy processing—high-energy ball milling, uniaxial compaction and vacuum sintering—then examined by scanning electron microscopy (SEM) to assess surface morphology, porosity and void distribution, and by X-ray diffraction (XRD) to identify crystalline phases and estimate crystallite size. Corrosion resistance was evaluated through potentiodynamic polarization tests to compare the performance of each reinforcement. Results demonstrate that the hybrid reinforcements yield a more uniform dispersion of secondary phases, reduced porosity and refined grain structure, leading to significantly improved corrosion performance. These enhancements make the composite a promising candidate for lightweight structural components in aerospace and automotive applications.

**Keywords:** ALMMC, Powder Metallurgy, MAX Phase, Corrosion resistance

# GREEN SYNTHESIS AND CHARACTERIZATION OF RAMIE, ROSE STEM AND PINEAPPLE-BASED EPOXY COMPOSITES FILLED WITH WALNUT FILLERS

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**Abstract:** This project investigates the Fabrication and Characterization of fibre-based polymer composite materials using natural fibres like ramie, rose petal, and pineapple fibres reinforced with epoxy matrix. To improve the mechanical and thermal properties, walnut shell fillers (ranging from 10 to 100 nm) were added to the material. The hand-lay-up technique was chosen for production because it was easy to execute and affordable. The ramie fibre composite is expected to exhibit superior tensile and flexural strength due to its high crystallinity, whereas pineapple fibre is anticipated to possess better impact resistance. Rose petal fibre, despite having lower mechanical strength, offers aesthetic and environmental advantages. The incorporation of walnut shell fillers is expected to enhance load transfer, toughness, and thermal stability by reinforcing the matrix and inhibiting crack propagation. During our research, we conducted various mechanical and thermal tests to analyse the properties of the fabricated composites. These tests provided valuable insights into their strength, durability, and thermal stability, aiding in a comprehensive performance evaluation. This research adds to the advancement of eco-friendly, high-performance bio-composites for various industries, including automotive, aerospace, and packaging, offering a sustainable substitute for synthetic materials.

**Keywords:** Rose petal, Ramie, Pineapple, Epoxy, Water absorption

# IMPROVEMENT IN AUTO SERVICE CENTER MANAGEMENT USING COMPUTER SIMULATION

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**Abstract:** The article presents a tool designed to enhance the strategic planning of auto service systems by integrating Decision Support Systems (DSS) with simulation models and optimization algorithms. These models optimize key aspects of an auto service network, such as spare parts logistics, workforce allocation, and service station capacity. By improving spare parts delivery, the system ensures timely and cost-effective supply chains, while optimized workforce allocation maintains service quality and minimizes labour costs. Additionally, determining the ideal number of service stations balances customer demand with available resources, preventing inefficiencies. The authors validated their models through verification processes and conducted a computer experiment using real-world data from an existing auto service network. The results confirmed the tool's effectiveness in assessing system performance and identifying areas for improvement. By facilitating data driven strategic planning, the proposed framework optimizes resource allocation, enhances operational efficiency, reduces costs, and improves customer satisfaction. Moreover, it addresses existing challenges while laying the foundation for future advancements in service-oriented systems. Ultimately, this tool serves as an asset for optimizing auto service networks, ensuring reliability, and improving overall performance.

**Keywords:** Simulation model, Extendsim, Decision Support System, Efficiency.

# INVESTIGATION OF SOLAR THERMAL COLLECTORS FOR REMOTE COOKING

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**Abstract:** This study presents an innovative design for a solar thermal collector (SC) aimed at achieving intermediate temperature ranges suitable for solar cooking. The primary objective is to showcase the effectiveness of this collector in supporting decentralized energy solutions by delivering sustainable energy for various applications. To assess the SC's performance, a detailed examination of its opto-thermal properties is conducted, with a focus on its use in cooking. The study uses thermal performance parameters (TPP) to test and evaluate the system's efficiency. The study examines two possible SC configurations, with a detailed assessment of how design changes effect overall thermal and energy performance. The effects of these adjustments on cooking efficiency, heat retention, and overall energy consumption are carefully investigated to identify the ideal configuration for practical use. In addition, the study calculates the effective concentration ratio (CEF) of the SC using thermal analysis methods. This parameter is crucial in understanding how well the system concentrates and uses solar energy for cooking applications. Moreover, the Generalized Cost of Solar-Cooked Meals (GCSC) is computed to evaluate the economic feasibility of the system.

**Keywords:** Off-grid cooking, Energy efficiency, Opto-thermal properties, Effective concentration ratio, Solar utilization, Heat retention.

# INTEGRATION OF ERGONOMICS AND WORK PROCESS FOR IMPROVED SAFETY AND EFFICIENCY OF SEAFARERS IN SHIP ENGINE ROOM: A DEMATEL APPROACH

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**Abstract:** Ensuring safety and efficiency of seafarers working in ship engine rooms (ERs) is essential for the sustainability of the maritime industry, the well-being of crew members and the overall operational effectiveness of vessels. ERs present a highly demanding work environment, marked by excessive noise levels, extreme temperatures, poor lighting conditions, confined workspaces and exposure to hazardous substances, all of which pose significant ergonomic and occupational health risks. This study integrates ergonomics and work process optimization using the Decision-Making Trial and Evaluation Laboratory (DEMATEL) approach to identify and analyse the critical risk variables affecting ER working conditions. The research was conducted through a combination of expert consultations and a questionnaire-based survey among maritime professionals, leading to a systematic evaluation of cause-and-effect relationships among risk factors. The study underscores the necessity for ergonomic interventions, structured work-rest cycles, improved safety protocols and the integration of advanced monitoring technologies to enhance workplace safety. By prioritizing risk mitigation strategies derived from the DEMATEL framework, this research provides actionable recommendations to maritime stakeholders for fostering safer and more efficient ER operations.

**Keywords:** Ship Engine Rooms; Seafarers Safety; Ergonomics; DEMATEL.

# OPTIMIZATION AND CHARACTERIZATION OF TI6AL4V KNEE PLATE COATING IN MAGNETRON SPUTTERING PROCESS

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**Abstract:** Artificial knee and hip joints made-up of Ti6Al4V is creating pus after a certain long interval of time due to excessive bacterial growth, oxidation, friction, wear, microstructure, and undesired mechanical properties. Titanium alloys like Ti6Al4V are widely used in biomedical applications due to their high strength, corrosion resistance, and biocompatibility. However, improving the surface properties of these materials, such as roughness, wettability, anti-oxidant, anti-wear and hardness is critical for enhanced biomedical performance. Present research aimed to providing a thin film coating of pure Titanium and pure silver on the substrate of Ti6Al4V alloy during magnetron sputtering process under control critical parameters as various power intensity and coating time to prevent pus formation. Coated material's surface characterization was done by recording surface roughness, detecting coating thickness, corrosion test and wear test. All the responses were compared with both the coating and also impact of Magnetron Sputtering critical parameters on responses were analysed. Result reviles that setting of operation parameters during Magnetron Sputtering process is playing crucial role for optimal Leyer thickness of coating.

**Keywords:** Ti6Al4V alloy, Coating through Magnetron Sputtering, Surface characterization, Optimization of process parameters.

# ROADMAP TO HUMAN-CENTRIC DIGITALIZATION: A CASE STUDY OF MACHINE TOOL MANUFACTURING ORGANIZATION

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**Abstract:** Rapid digital advancements are significantly transforming industries and society. This transformation is leading towards human-centric digitalization. Human-centric digitalization prioritizes individual needs, wellbeing, and experience. It integrates cutting-edge technologies like Artificial Intelligence (AI), the Internet of Things (IoT), Cloud Computing, and Blockchain. The goal is to create smarter and more inclusive digital ecosystems. This project explores the roadmap for human-centric digitalization. Exploration includes key technologies, associated challenges, and emerging opportunities. The study emphasizes designing technology that empowers individuals. It also highlights the importance of ethical data usage. Ultimately, the aim is to enhance the quality of life through digital solutions. A comprehensive understanding of human-centric digitalization is crucial for creating sustainable and user- friendly digital solutions for the future. Current study has improved the material handing facilities in a machine tool manufacturing organization.

**Keywords:** Human centric digitalization, Material handling, Operational excellence, SMEs.

# SMART CYLINDER FOR THE HYDROGEN STORAGE IN AUTOMOTIVE VEHICLES

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**Abstract:** The efficient storage of hydrogen remains a key challenge in the advancement of hydrogen-powered vehicles. Smart materials offer innovative solutions by enhancing storage capacity, safety, and durability. Among these, shape-memory alloys (SMAs) and self-healing metal matrix composites (MMCs) have shown significant ability for high-performance hydrogen storage. Smart materials are engineered to exhibit one or more properties that can be significantly altered in a controlled manner by external stimuli such as heat, stress, moisture, electricity, or magnetic fields. SMAs contribute as reinforcement to support the structure of the composite materials as well as inducing the self-healing ability for storage optimization through controlled shape transformations that improve hydrogen containment. Meanwhile, the self-healing capability of advanced MMCs allows them to autonomously repair microcracks and damage caused by hydrogen-induced stresses, thereby maintaining structural integrity over repeated use cycles. The integration of nanostructured coatings and protective layers further mitigates hydrogen embrittlement—a common issue in metal-based storage solutions. In addition, smart storage systems equipped with sensors and AI-driven monitoring provide real-time data on hydrogen levels and system health, enhancing overall performance and safety. This research focuses on the synthesis, characterization, and testing of the self-healing metal matrix composite, emphasizing its mechanical strength, hydrogen uptake efficiency, and thermal stability. Experimental analysis reveals that the smart self-healing composite exhibits high hydrogen storage capacity, exceptional structural resilience, and superior resistance to embrittlement compared to conventional metal-based storage materials.

**Keywords:** Smart Cylinder, Self-healing metal matrix composite, Shape memory alloy(SMA), Hydrogen powered vehicle, metal matrix composite (MMC)

# THERMODYNAMIC INVESTIGATION AND OPTIMIZATION OF A SOLAR-WIND-HYDROGEN HYBRID ENERGY SYSTEM

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**Abstract:** A Solar-Wind-Hydrogen hybrid renewable energy system (HRES) integrates solar photovoltaic (PV), wind turbines, and hydrogen storage to enhance reliability and efficiency in meeting rising energy demands. Seasonal performance analysis highlights solar and wind complementarity, hydrogen production, and storage dynamics across summer and winter. Mathematical models for solar irradiance, wind power, and hydrogen subsystems quantify energy generation, while the Levelized Cost of Energy (LCOE) assesses economic feasibility. Solar power peaks midday (35.33 MW in summer), with wind complementing evenings and mornings (35.86 MW peak), enabling hydrogen production above a 50 MW threshold—yielding seasonal highs of 3.21 kg in summer evenings and 3.20 kg in winter mornings. LCOE projections from 2025 to 2045 show declines: Solar PV from 4.5 to 2.0 /kWh, Wind from 5.0 to 2.5 /kWh, and Hydrogen from 14.0 to 5.0 /kWh, driven by technological advancements. Sensitivity analysis identifies operational and capital costs as key drivers. The system mitigates intermittency, optimizes resources, and reduces emissions, offering a scalable, sustainable solution for diverse climates and advancing the transition to renewable energy dominance.

**Keywords:** Hybrid Renewable Energy, Solar-Wind-Hydrogen, Energy Storage, Levelized Cost of Energy (LCOE), Seasonal Performance.

# ABSTRACTS

## DEPARTMENT OF CSE

# A MACHINE LEARNING APPROACH FOR BREAST CANCER SCREENING AND DETECTION

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**Abstract:** Breast cancer remains a critical health concern, with early detection playing a vital role in improving survival rates. This project, titled "A Machine Learning Approach for Breast Cancer Screening and Detection," aims to develop a practical application leveraging machine learning (ML) for classifying mammographic images as benign or malignant. By integrating predictive ML models into an accessible application, this project seeks to empower users with preliminary diagnostic capabilities while recommending further medical consultation if needed. Building on prior research, Logistic Regression (LR) and Support Vector Machine (SVM) models were identified as the best-performing algorithms when trained on the Wisconsin Breast Cancer Dataset. This semester, the focus will shift to enhancing these models with mammographic image datasets to analyze radiological features more effectively. The application will allow users to upload mammographic images, process them through pre-trained models, and output predictions along with healthcare suggestions. The methodology includes dataset preparation, image preprocessing, model refinement, and app development using frameworks like Flask. Data preprocessing will involve augmentation techniques to improve the models' robustness. For evaluation, metrics such as accuracy, precision, and recall will be used. This project aims to contribute to early-stage breast cancer detection, offering a cost-effective and user-friendly screening tool.

**Keywords:** Breast Cancer, Mammography, Machine Learning, SVM, LR

# A NOVEL APPROACH TOWARDS COMPREHENSIVE EXPENSE MONITORING SYSTEM

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**Abstract:** In the quick-paced digital world of today, efficient financial management is increasingly important for individuals and organizations. Traditional methods of expense monitoring, such as manual record-keeping and spreadsheets, are error-prone and inefficient. To address these challenges, the proposed work presents the design, development, and deployment of a full stack comprehensive expense monitoring system. This system automates expense tracking, categorization, and budgeting, while providing insightful analytics to help users better manage their finances. The front-end is developed using React.js, offering a dynamic and end user friendly interface, while the backend is built using Node.js with Express.js, handling the logic and data processing. MongoDB serves as its database, providing scalability and flexibility in data storage. Security measures such as JavaScript Object Notation (JSON) Web Tokens based authentication, data encryption, and secure communication protocols are integrated to ensure the protection of user data. This paper details the system's architecture, implementation, and testing, highlighting its effectiveness in improving financial management practices. The results demonstrate that the system is efficient, secure, and scalable, making it a viable solution for both personal and business use.

**Keywords**: Full Stack, Expense monitoring, Insightful Analytics, Financial Management, JSON Web Tokens.

# A NOVEL APPROACH TOWARDS VEHICLE LANE TRACING USING AUTO VISION TECHNIQUES

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**Abstract:** This work introduces a new method for tracking vehicle lanes using sophisticated visual recognition methods. The swift advancement of self-driving technology makes precise lane detection and tracking essential for secure and dependable vehicle navigation. The method suggested involves using different computer vision algorithms such as edge detection, color space transformation, and Hough Transform to precisely locate and follow lane markings under different road conditions. Furthermore, machine learning algorithms are incorporated to improve the system's ability to manage obstacles like occlusions, changing lighting conditions, and complicated road structures. The system is intended for use in modern autonomous vehicles, operating in real-time. Thorough testing in various settings proves the efficiency of the method, indicating notable enhancements in both accuracy and processing speed when compared to traditional techniques. This research work helps advance safer and more dependable self-driving systems with a new approach for detecting lanes and guiding vehicles. Building a system that helps an automobile go around a simulated street map while maintaining in its lane. The driving force behind this project is the swift advancement of autonomous vehicle technologies.

**Keywords**: Vehicle Lane Tracing, Auto Vision, Computer Vision, Self-Driving, Vehicle Monitoring.

# A PLANT CARE LLM AND COMPUTER VISION PROJECT

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**Abstract:** This project introduces a comprehensive Multilingual Plant Care System aimed at assisting users in maintaining plant health through an integrated set of intelligent modules. The system features three primary components: a Multilingual Chatbot, a Plant Disease Detection Module, and a Watering Recommendation System. The chatbot enhances accessibility by interacting with users in multiple languages, delivering real-time, context-aware responses to plant-related queries. The Plant Disease Detection Module employs advanced image processing and machine learning techniques to accurately identify plant diseases from leaf images, enabling early diagnosis and timely intervention. Additionally, the Watering Recommendation System leverages location-specific data—such as weather conditions, soil type, and environmental factors—to provide personalized watering guidance. Together, these modules create a robust, user-friendly platform that simplifies the complexities of plant care. By promoting early detection, proper care, and resource optimization, the system fosters sustainable gardening practices and supports users across diverse linguistic and geographic backgrounds.

**Keywords:** RAG (Retrieval Augmented Generation), LLM(Large Language Model), LLAMA-2.0,Helinski model, CNN(Convolutional neural network)

# ADVANCED MACHINE LEARNING AND DEEP LEARNING TECHNIQUES FOR THE DETECTION AND CLASSIFICATION OF MANIPULATED MULTIMEDIA CONTENT

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**Abstract:** Deepfake technology has evolved to produce highly convincing manipulated content, raising serious concerns about media integrity. With the increasing accessibility of tools like Generative Adversarial Networks (GANs), creating high-quality deepfakes has become effortless, even for unskilled users. This paper focuses on detecting and classifying manipulated multimedia content using deep learning techniques, specifically targeting video-based deepfakes stored in formats such as AVI and MOV. Advanced architectures, including ConvNeXt with Swin Transformers and CNN models like CapsuleNet with LSTM, are reviewed for their ability to capture spatial and temporal artifacts in video frames. The paper discusses how these models address challenges in detecting subtle inconsistencies introduced during manipulation. Additionally, it examines dataset limitations, model robustness, and real-world applicability. This review aims to provide insights into recent advancements in video deepfake detection, highlight the strengths and weaknesses of existing approaches, and encourage further development in this rapidly evolving field to safeguard media authenticity.

**Keywords:** Deepfake, Detection, Deep Learning, Video, GANs

# ADVANCING CROSS-LANGUAGE VOICE CLONING IN HIGHER EDUCATION

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**Abstract:** This project presents a cross-language voice cloning system designed to enhance multilingual communication in higher education. Users can record or upload English speech, which is converted into text, translated into Spanish, French, and Mandarin, and synthesized back into speech while preserving the original vocal characteristics. The system integrates OpenAI Whisper for speech-to-text, Neural Machine Translation (NMT) models for accurate translation, and AI-driven text-to-speech models with voice cloning capabilities. Leveraging deep learning and cloud-based processing, it ensures high precision and real-time performance. Key outcomes include a Word Error Rate (WER) of 5.1% for transcription, BLEU scores above 70% for translation, a Mean Opinion Score (MOS) of 4.7 for speech naturalness, and an 80% user satisfaction rate among students. The project also addresses challenges such as real-time processing constraints and ethical considerations in voice cloning. Ultimately, it aims to make education more accessible across languages, fostering global collaboration and delivering personalized learning experiences.

**Keywords:** NMT, MOS, Whisper, Multilingual Education, Textspeak

# AI AGENTS IN HEALTHCARE: DIAGNOSIS AND PATIENT SUPPORT – STUDYING HOW AI CAN ASSIST DOCTORS AND PATIENTS IN DECISION-MAKING AND MONITORING

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**Abstract:** Artificial Intelligence (AI) is transforming healthcare by enhancing diagnostic accuracy, optimizing patient monitoring, and supporting clinical decision-making. AI-powered tools, such as machine learning algorithms and natural language processing (NLP), assist doctors in detecting diseases at early stages, reducing diagnostic errors, and personalizing treatment plans. AI-driven chatbots and virtual assistants also improve patient engagement by providing real-time support, symptom analysis, and health recommendations. Furthermore, wearable devices integrated with AI enable continuous health monitoring, alerting physicians to potential health risks. Despite its benefits, challenges such as data privacy, bias in AI models, and ethical considerations must be addressed. Future research should focus on improving AI's reliability, transparency, and integration with existing healthcare systems. This study explores AI's role in diagnosis and patient support, evaluating its effectiveness and limitations through a systematic analysis of current advancements and potential applications.

**Keywords:** Artificial Intelligence, Healthcare, Diagnosis, Patient Support, Clinical Decision-Making

# AI ASSISTANCE FOR VISUALLY IMPAIRED PEOPLE

Aditya Raj, Arjun Singh, Abhishek Sharma, Abhishek Chaudhari,Sanjiv Kumar Tomar

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**Abstract:** This project explores the development of an AI-based assistance system designed to enhance the independence and quality of life for visually impaired individuals. Leveraging advancements in computer vision, natural language processing, and wearable technologies, the system aims to interpret visual information from the environment and convert it into intuitive audio feedback. Key features include object recognition, obstacle detection, facial recognition, and real-time scene description. By integrating deep learning models with mobile and edge computing devices, the solution offers portability, low latency, and high reliability. The project also focuses on creating an intuitive user interface, ensuring that the system is accessible to users with varying degrees of visual impairment. Extensive testing with real users ensures that the solution is adaptable to diverse environments, from indoor settings to complex outdoor scenarios. The AI assistance tool not only promotes autonomy but also enhances social interactions and personal safety for visually impaired individuals. This project demonstrates how artificial intelligence can be ethically and effectively applied to address real-world accessibility challenges, paving the way for future innovations in assistive technologies.

**Keywords**: Artificial Intelligence, Assistive Technology, Computer Vision, Visual Impairment and Accessibility.

# AI DRIVEN FASHION ADVISOR

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**Abstract:** The AI-Powered Personalized Wardrobe Planner automates outfit selection process through deep learning and optimization algorithms. The user clothing classification process uses a ResNet model to label user uploaded wardrobe items and then genetic algorithm is used to recommend outfits based on weather conditions, scheduled events and user profile choices. The system implements a seamless user-friendly interface that merges React frontend alongside Flask backend and Firebase storage. The model's classification accuracy, outfit suggestions' relevance, and day-to-day diversity are assessed by taking real user feedback. The project shows AI technology's capability to automate wardrobe organization while creating stylish recommendations for users to reduce decision fatigue and modernise daily routines

**Keywords:** Personalized Wardrobe, Outfit Recommendation, Genetic Algorithm, AI Clothing Assistant

# AI IMAGE ENHANCER: DETECTING AND REFINING AI GENERATED IMAGES

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**Abstract:** New breakthroughs in AI-generated imaging technology have produced synthetic images that are indistinguishable from authentic ones, creating serious concerns regarding media authenticity and ethical application. Our paper, "AI Image Enhancer: Detection and Fine-Tuning AI-Generated Images," counters this challenge through the use of a model based on Deep Convolutional Generative Adversarial Networks (DCGANs) for image generation and discrimination. The project is divided into two broad phases. In the first phase, DCGANs are used to produce high-resolution synthetic images with greater realism, refining details such as texture, lighting, and overall image authenticity. In the second phase, the discriminator unit of DCGAN is leveraged to distinguish real images from AI-generated ones based on finding subtle artifacts and inconsistencies. By using DCGANs for generation and detection, our method guarantees the creation of more realistic synthetic images while also allowing for detection of AI-generated images

**Keywords:** DCGAN, Image Generation, Media Authenticity, Image Detection

# AI IMAGE GENERATORS USING MACHINE LEARNING

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**Abstract:** Worldwide, machine learning has been widely considered in several contexts including the healthcare sector which is not an exception. Machine learning is a potential critical tool in the prognosis and diagnosis of heart diseases, locomotor disorders, and other conditions. If sufficiently identified ahead of time, this information could provide physicians with valuable insights enabling them to adjust their diagnosis and treatment plan focussed to individual patients. Our aim is to employ machine learning algorithms which can be used for predicting Image in humans. Because these two conditions are related, we can also identify people who have cardiac problems. Our project involves a comparative analysis of various classifiers, including logistic regression, decision trees, and random forests.. Additionally, we propose an ensemble classifier which will be an allrounder combining the strengths and weaknesses of multiple classifiers. This allows us to helping in training and validation of large amounts of data. Finally, we analyze both existing and proposed classifiers, such as Ada-boost, to provide superior predictive analysis and accuracy.

**Keywords:** Machine Learning, Heart Disease, Classifiers, Ensemble Classifier, Predictive Analysis

# AI INTERVENTIONS FOR FALSE INFORMATION

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**Abstract:** The surge of false information with the advent of Generative AI and bots poses significant challenges in the modern digital ecosystem, posing a serious threat to public integrity and welfare. Our research examines AI interventions for false information by labelling and mitigating it using the advanced text classification models developed in NLP. We implemented and evaluated multiple deep learning architectures on the latest WELFake dataset containing more than 60,000 parameters containing headlines labeled 0(false) and 1(true). We used techniques of data cleaning , preprocessing and vector embeddings such as GloVe which helped fine tune our models to higher accuracies. Our work shows that transformer-based models have a significant edge over the traditional deep learning models, reflected clearly in their accuracy scores with BERT :96% , ALBERT : 94%, CNN-BiLSTM : 90.7%, LSTM : 90.5%. The models show better generalization as well, reflected in their precision-recall and F1 scores. These results highlight the efficiency of AI-driven solutions and showcase their potential for developing autonomous misinformation labelling systems. Future work could focus on labelling other forms of media and real-time deployment to enhance practical applications

**Keywords:** Natural Language Processing (NLP) , AI for information , Text Classification , Large Language Models(LLMs), Deep Learning

# AI POWERED CERVICAL CANCER PROGNOSTICS: A MACHINE LEARNING APPROACH

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**Abstract:** Cervical cancer remains a major cause of death among women, especially in low- and middle-income countries due to limited access to early diagnostics. Traditional methods like Pap smears and HPV tests, while effective, are often resource-intensive and prone to variability. This project presents a machine learning (ML)-based diagnostic framework designed to predict cervical cancer outcomes using real-world clinical data. After preprocessing the dataset—handling missing values, normalizing features, and balancing classes—feature selection techniques like Recursive Feature Elimination and correlation analysis identify key predictors. Various ML models, including logistic regression, decision trees, SVMs, random forests, gradient boosting, and deep neural networks, are evaluated using metrics such as accuracy, precision, recall, F1 score, and AUC. Ensemble models and deep learning achieved accuracies over 94%. A user-friendly Python Tkinter-based GUI allows clinicians to input data and visualize results like ROC curves and confusion matrices. The Random Forest model offered a strong balance of accuracy and interpretability. This system demonstrates the transformative potential of AI in early cancer diagnosis, even in resource-limited settings.

**Keywords:** Cervical cancer prediction, Machine learning, Clinical data analysis, Random Forest, Early diagnosis system

# AI POWERED CHATBOT FOR CYBER CRIME PREVENTION AND DETECTION

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**Abstract:** As we find ourselves involved in the digital world this growth has been accompanied by the increasing threat posed by cybercrime to individuals, enterprises, and states across the globe. AI-powered chat systems are one of the AI technologies for combating cybercrime. Abstract of This paper is based on the creation of an artificial intelligence powered chatbot, which can be used for prevention and detection of cybercrime. This chat is powered by AI so it is designed to read the huge volume of data and notify the users about suspicious activities and security risks. Machine learning algorithms enable the system to learn and adapt to new cyber threats, making it effective. The system uses an interactive chatbot interface a friendly medium for people to engage with technology to report incidents, obtain guidance on cyber security, and gain real- time support for responding to breaches. The chat system can converse in natural language making interaction feel more human and effectively sharing information. This initiative aims to equip individuals and businesses with the tools to combat cyber threats using the AI tech, thus enhancing the security and resilience of our digital landscape.

**Keywords:** Cybercrime, AI Chatbot, Machine Learning, CyberSecurity, Threat Detection

# AI POWERED INTER APPLICATION AUTOMATION SUITE

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**Abstract:** The convergence of artificial intelligence (AI) and automation is fundamentally reshaping industrial operations, driving efficiency, precision, and innovation across sectors. This paper explores the transformative impact of AI driven automation on traditional domains such as finance, healthcare, and manufacturing. By minimizing manual intervention and enhancing decision-making capabilities, AI-powered systems enable organizations to optimize workflows, reduce operational costs, and respond dynamically to complex challenges. Real world implementations, including intelligent diagnostic tools and autonomous production systems, illustrate the practical benefits of this technological evolution. Furthermore, emerging applications in domains like autonomous mobility and smart infrastructure highlight the broader societal value of intelligent automation. However, the widespread adoption of these technologies also introduces critical considerations regarding data privacy, ethical governance, and workforce transformation. Addressing these challenges will be essential to ensuring sustainable integration and maximizing long-term benefits. This study presents BilloFlow, an open-source platform designed to make cross application automation accessible to non-technical users, offering insights into its architecture, performance, and potential for widespread adoption.

**Keywords:** Automation, Productivity, Workflow, Artificial Intelligence (AI), Technological Revolution

# AI POWERED PLANT PATHOLOGY PLATFORM: INTEGRATING VISUAL AND DATA ANALYSIS

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**Abstract:** The application of artificial intelligence (AI) in plant pathology is transforming disease detection and management, providing a data-driven approach to precision agriculture. This research aims to develop an AI-powered platform that integrates machine learning (ML) and computer vision for realtime disease diagnosis in crops. The system identifies symptoms such as wilting, blights, and leaf spots by analysing plant images, improving accuracy through environmental data, soil health metrics, and historical crop records. The platform employs deep learning models, particularly convolutional neural networks (CNNs), for automated feature extraction and disease classification. A predictive analytics module enhances early warning capabilities and suggests optimized treatment strategies. A web-based interface enables farmers to upload images, receive real-time diagnostic feedback, and access interactive disease management tools. Cloud-based deployment ensures scalability, fast data processing, and seamless integration with IoT-enabled agricultural systems. This AI-driven solution enhances disease diagnosis, minimizes excessive pesticide use, and improves crop health, leading to higher agricultural productivity. By continuously evolving through data updates and model retraining, the platform represents a significant step toward sustainable farming practices

**Keywords:** Artificial Intelligence, Plant Pathology, Machine Learning, Computer Vision, Precision Agriculture.

# AI SURVEILLANCE NET: INTELLIGENT OCCLUSION HANDLING IN VIDEO SURVEILLANCE

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**Abstract:** This project presents AI Surveillance Net, an advanced video monitoring system that effectively addresses occlusion challenges in surveillance applications. By integrating two specialized deep learning models, we've created a comprehensive solution for urban traffic monitoring and security. The first model, powered by YOLOv11, performs license plate detection and optical character recognition (OCR), accurately identifying and extracting alphanumeric information even in suboptimal viewing conditions. The second model, built on YOLOv8, handles vehicle classification and detection with remarkable precision across various environmental scenarios. The system's architecture seamlessly combines these models using Python, creating a unified pipeline that processes video streams in real-time. A Streamlit-based frontend provides an intuitive user interface for monitoring and analysis, while a Python backend handles complex data processing and model integration. AI Surveillance Net demonstrates significant improvements in surveillance capabilities, particularly in scenarios where vehicles are partially obscured or lighting conditions are challenging. The system represents a practical application of cutting-edge computer vision techniques to enhance public safety and traffic management systems

**Keywords:** Computer Vision, YOLO, Occlusion Handling, License Plate Recognition, Surveillance Systems

# AI-DRIVEN IMAGE SYNTHESIS: TRANSFORMING DIGITAL ART AND DESIGN

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**Abstract:** This project explores style transfer using the VGG19 model, where the artistic style from a chosen style image is blended with the content of a target image to create a visually appealing output. The model leverages convolutional neural networks (CNN) to separate and recombine the style and content of the images. By adjusting the weights of the style and content loss, the user can control the degree of style or content dominance in the final output. This allows users to create different variations, such as more style-heavy or content-focused outputs, based on their preferences. The project incorporates an optimization-based approach using gradient descent to minimize the total loss, which includes both style and content losses. The flexibility of the model ensures that users can explore various combinations of artistic effects and structural details. To enhance the user experience, an interactive user interface (UI) will be developed, enabling users to upload images, adjust style-content ratios through sliders, and preview the results in real-time. This project aims to provide a creative platform for artists and designers to experiment with style transfer, facilitating artistic expression and creative exploration.

**Keywords:** VGG-19, convolutional neural networks (CNN), style transfer, real-time, artistic style

# AI-DRIVEN PERSONALIZED CUSTOMER SUPPORT WITH RL AND RECOMMENDATION SYSTEMS

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**Abstract:** Artificial intelligence (AI) integration into customer support systems is becoming more and More important for companies trying to keep up with the ever-increasing needs of their Customers in today's quickly changing customer care industry. In order to enhance automated Response generation, this research suggests a novel hybrid framework that combines the potent Powers of a Reinforcement Learning (RL) agent with a BERT-based classifier for real-time Ticket categorization. Improving customer support interactions' accuracy, speed, and general Efficiency is the main goal. By utilizing feedback-driven learning and Natural Language Processing (NLP), the system tackles two major issues: delayed responses and incorrect ticket Routing, resulting in a considerable improvement in service quality. A custom dataset that was gathered from Hugging Face and included a range of customer Requests from different industries was used to train the model. Utilizing statistical methods like Confidence intervals and t-tests, the research verifies the noteworthy enhancements in Performance of the suggested model in comparison to current solutions. According to the Research, AI-driven hybrid models can revolutionize customer assistance by increasing user Satisfaction, decreasing operating expenses, and increasing issue resolution accuracy. This Study establishes the foundation for customer service solutions that are more responsive, Flexible, and scalable, highlighting AI as a major force behind client engagement in a variety Of industries going forward. Keywords : Artificial Intelligence (AI), Customer Support Systems, Reinforcement Learning (RL), BERT, NLP, Hybrid AI models

**Keywords:** AI, Customer Support, Reinforcement Learning, NLP, Ticket Categorization

# AI-DRIVEN SHOPPING ASSISTANT

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**Abstract:** The growing development of fashion e-commerce has presented challenges related to product discovery, customer engagement and personalized recommendations. This paper presents an AI-Driven Shopping Assistant that will use Natural Language Processing (NLP), Web Scraping, OpenAI APIs, and Recommendation Systems which will make the shopping experience more personalized. The Recommendation Engine uses vector similarity search algorithms and filters based on user profiling for providing highly personalized product suggestions. For user profiling the chatbot uses Natural Language Processing model for collecting data such as user preferences, purchase history and skin tone. This assistant makes the search simple as it reduces the time-taking task of manual scrolling and filtering of products from a large product catalogue and also gives fashion tips along with human-like interaction, which enhances the shopping experience by making it effortless and joyful. Moreover, it benefits users who prefer less social interaction with salesperson. This prototype will facilitate human-like interactions and personalized recommendations, which will increase customer satisfaction and conversion rates.

**Keywords:** AI-based models, virtual shopping assistant, fashion e-commerce, prompt engineering, personalized recommendation.

# ALZHEIMER'S DISEASE PREDICTION USING MACHINE LEARNING ALGORITHM

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**Abstract:** Controlling the progression of Alzheimer's disease (AD), a progressive neurological illness that results in memory loss, cognitive decline, and behavioural changes, and improving the quality of life for patients depend on early detection. Cognitive testing and neuroimaging technologies like as MRI and PET scans are used in conventional diagnostic approaches; however, these methods are often expensive, time-consuming, and require professional interpretation. Convolutional Neural Networks (CNNs), a subset of deep learning techniques, have demonstrated promise in the automated processing of medical pictures for the diagnosis of AD in recent years.This study looks at how CNNs can be used to predict Alzheimer's disease from structural MRI scans. It provides information on how well CNN based models perform for early diagnosis and highlights how deep learning could revolutionise AD detection.

**Keywords:** Alzheimer Disease, CNN, Early Diagnosis, Neuroimaging, MRI

# AMADEL: ANDROID MALWARE ANALYSIS USING DEEP LEARNING

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**Abstract:** Android malware detection has become a critical challenge due to the increasing sophistication of malicious applications. Traditional signature-based and heuristic methods struggle to keep up with evolving threats, necessitating the use of deep learning-based approaches. In this study, we propose a hybrid deep learning framework leveraging Convolutional Neural Networks (CNNs) for accurate and efficient Android malware detection. Our methodology transforms Android application features, such as opcode sequences and API call graphs, into image-like representations for analysis which are used by CNNs to extract spatial patterns. Additionally, we employ an ensemble learning strategy to integrate predictions from multiple models, improving generalization and detection accuracy. Experimental evaluations on benchmark Android malware datasets demonstrate that our approach outperforms existing methods in terms of precision, recall, and F1-score. The results highlight the effectiveness of deep learning-based ensemble models in detecting Android malware with high accuracy and robustness.

**Keywords:** Android Malware, Deep Learning, CNN, Malware Detection, Ensemble Learning

# ANALYZING THE IMPACT OF AIR QUALITY ON UV INDEX USING REAL-TIME WEATHER DATA FROM MAJOR CITIES ACROSS THE WORLD

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**Abstract:** Ultraviolet radiation from sunlight has both beneficial and harmful effects on human health, with the UV index serving as a crucial metric for assessing potential harm. Excessive exposure can lead to skin cancers, cataracts, and immune suppression. Air quality influences the UV index by affecting the scattering and absorption of UV radiation, with pollutants altering the radiation reaching the Earth's surface. This study utilizes real-time weather data from major cities worldwide, capturing diverse climatic conditions and air quality variations. Focusing on UV index prediction, it employs a comparative analysis of regression models, including linear regression, decision trees, support vector machines, logistic regression, random forest, XGBoost, LightGBM, gradient boosting, and neural networks. The analysis aims to determine the most effective model for capturing relationships between meteorological variables like temperature, wind degree, and precipitation. The findings provide insights into the interplay between air quality and UV radiation, contributing to improved sun exposure risk assessments and region-specific forecasting models for public health.

**Keywords:** Ultraviolet radiation, Air quality, Regression models, XGBoost, LightGBM

# ANALYZING VIDEO SURVEILLANCE TO HANDLE TRAFFIC OCCLUSION

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**Abstract:** The AI Traffic Management System utilizes video footage or live video streams to monitor and analyze traffic in real time. The system detects and counts vehicles, measures their speeds, and displays the results in real-time, offering valuable insights into traffic flow and vehicle behavior. Vehicle counts are updated every 10 seconds, and speed calculations are displayed directly on the video feed, making it easier for authorities to understand traffic dynamics. The data is logged in a database every 10 seconds for detailed analysis. The associated Analysis System leverages data analytics tools to provide deeper insights through visualizations, including traffic heatmaps, speed distributions, and daily trends. The system aids traffic management authorities in making informed decisions, optimizing traffic flow, reducing congestion, and ensuring public safety. This integrated approach provides a dynamic solution for modern urban traffic challenges.

**Keywords:** Traffic Management, AI, Vehicle Detection, Real Time Analytics, Traffic Flow

# ARTIFICIAL INTELLIGENCE BASED DEEPFAKE DETECTION: IMAGES AND VIDEOS

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**Abstract:** Deepfake technology has emerged as a major threat to digital media integrity, raising serious concerns around privacy, misinformation, and public trust. This research aims to develop a robust and reliable deepfake detection system using a Convolutional Neural Network (CNN)-based approach. The purpose was to accurately distinguish between real and manipulated facial images by leveraging advanced data preprocessing, image normalization, and diverse augmentation techniques, including GAN-based synthesis and adversarial training. A well-structured CNN model was trained and evaluated using a balanced dataset of real and fake images, incorporating strategies to reduce overfitting and improve generalization. The model achieved a high detection accuracy of 92.05%, showing strong performance even under complex image manipulations. However, challenges such as light reflection artifacts and environmental distortions still posed limitations. Through performance evaluation, including confusion matrix, ROC, and precision-recall curves, the model's strengths and weaknesses were thoroughly analyzed. The study concludes by emphasizing the need for future research in real-time detection, multimodal analysis, and explainable AI to build more transparent and trustworthy deepfake detection systems.

**Keywords:** Deepfake detection, CNN, GAN, adversarial training, real-time detection.

# AI-DRIVEN MEDICAL CHATBOT: BRIDGING THE GAP BETWEEN PATIENTS AND HEALTHCARE

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**Abstract:** India faces serious healthcare challenges, including a doctor-patient ratio of 1:836, delayed emergency responses, and limited rural infrastructure. Overcrowded hospitals often struggle with routine non-emergency cases, underscoring the need for better first aid solutions. QuickAid, our proposed medical chatbot, addresses this gap by offering immediate, cost-effective, and multimodal emergency support, especially in rural areas. Harnessing the power of artificial intelligence, QuickAid integrates Retrieval-Augmented Generation (RAG) with Large Language Models (LLMs) to combine authoritative medical knowledge with generative AI. This hybrid approach ensures accurate, context-relevant, and timely first aid guidance, covering a wide range of emergencies such as choking, cardiac arrest, and severe bleeding. Users can interact via text or audio, which enhances accessibility, while structured retrieval lowers the risk of errors. Experimental results confirm QuickAid's effectiveness, with a BLEU score of 0.87 and ROUGE scores of 0.92 (ROUGE-1), 0.85 (ROUGE-2), and 0.91 (ROUGE-L). By providing high-accuracy advice and reducing hospital overload, QuickAid holds promise for improving patient outcomes and bridging critical gaps in India's healthcare system.

**Keywords:** Healthcare Chatbot, First Aid, Retrieval-Augmented Generation (RAG), Large Language Models (LLMs), Emergency Support.

# ARTIFICIAL INTELLIGENCE BASED IMAGE ANALYSIS FOR PERSONALIZED RECOMMENDATION

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**Abstract:** Virtual try-on technology has transformed the landscape of fashion e-commerce by allowing users to see how clothing items would appear on a specific individual image without the need for physical fitting. Current techniques predominantly utilize deep learning-based image synthesis, facing significant challenges such as realistic garment deformation, seamless integration of garments with the person, and adaptation to various poses. In this study, we introduce a hybrid virtual try-on framework that combines several deep learning models to achieve high-quality garment transfer while maintaining intricate details and proper body alignment. Initially, we utilize a U-Net-based human parsing method to delineate different body and clothing segments, facilitating accurate garment placement. For precise body structure and accurate warping we use DensePose R-CNN predicts correspondence between 2D image pixel and canonical 3D human model, Even when working with 2D images, it estimates UV coordinates that map each pixel to a 3D surface For garment deformation, we implement Thin Plate Spline (TPS) transformation alongside Appearance Flow Warping, which guarantees smooth warping with minimal distortion. Lastly, we integrate a CycleGAN-based refinement module to enhance texture consistency, remove artifacts, and seamlessly merge the warped garment with the individual image

**Keywords:** Virtual Try-On, Garment Warping, DensePose, Thin Plate Spline, CycleGAN Refinement.

# AUDIO CLASSIFICATION USING DEEP LEARNING

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**Abstract:** This paper presents a system designed to automatically generate multilingual subtitles for video content. The system extracts audio from video files, uses OpenAI's Whisper model for speech-to-text conversion, and subsequently applies the Helsinki-NLP translation model to generate translated subtitles. We discuss the architecture, evaluate the performance of the system across multiple languages, and present potential improvements for real-world use cases.

**Keywords:** Multilingual Subtitles, SpeechToText, Whisper, Translation Model, Subtitle Generationpedal Robot, Reinforcement Learning, Dynamic Balancing, Recurrent PPO, MuJoCo Simulation

# AURALIS: OBJECT DETECTION FOR THE VISUALLY IMPAIRED

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**Abstract:** Auralis is an advanced AI-driven solution initially designed to assist visually impaired individuals by offering real-time environmental awareness through object detection, proximity assessment, and voice interaction. This paper broadens its application to the aerospace sector, investigating its suitability for aircraft maintenance, unmanned aerial vehicle (UAV) operations, and astronaut support. Our study adapts Auralis for high-performance, low-latency conditions, preserving essential edge-processing capabilities vital for aerospace applications. Evaluation findings reveal significant improvements in accuracy, responsiveness, and user-friendliness. This versatile system illustrates the potential of inclusive technology to fulfill specific needs in intricate fields such as aerospace.

**Keywords:** Auralis, AI, Object Detection, Aerospace, Edge Processing

# AUTOMATED VIDEO TRANSCRIPTION AND SUMMARISATION

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**Abstract:** The rapid growth of multimedia content on platforms like YouTube has spurred the need for automated systems capable of processing and summarising video data. Manual transcription and summarisation are both time- consuming and labor-intensive, and often impractical at scale. This paper explores a novel framework for automated video transcription and summarisation using the YouTube Transcript API, Natural Language Toolkit (NLTK), and Hugging Face Transformers. The transcription process retrieves subtitles from YouTube videos, and two summarisation approaches are implemented: extractive summarisation using NLTK and abstractive summarisation using Hugging Face Transformers. The paper conducts a comparative analysis between the two methods, evaluating performance based on key metrics such as coherence, conciseness, and semantic relevance. The results indicate that Transformer-based summarisation produces more coherent, concise, and semantically rich summaries compared to traditional extractive methods, highlighting the promise of deep learning models for large-scale video content summarisation.

**Keywords:** Video Summarisation, Transcription, NLTK, Hugging Face, Deep Learning

# BILINGUAL FAKE NEWS DETECTION

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**Abstract:** The rise of social media has led to an increase in fake news, which profoundly impacts society. Fake news, often spread for profit or political influence, was notably rampant during the 2016 US elections and the nomination of a new Air Marshal in India. Addressing this issue is crucial due to its significant negative effects on mental health and societal well-being. The major challenges in fake news detection include the versatile nature of deceptive information and the difficulty in obtaining a generalized dataset. Extracting relevant features to detect fake news across various domains is hard. Detecting fake news on newly emerged events is challenging due to limited information, making single-technique solutions insufficient for achieving the required efficiency. Identity deception on big data platforms like social media is increasingly problematic due to their rapid growth and evolution. As social media becomes a preferred means of communication, it attracts spammers and scammers. Cyberthreats such as spamming, which involves sending unsolicited messages, now appear on these platforms in different forms. Analyzing interactions can reveal valuable behavior patterns and conversation topics, which can improve services or products. However, this information can also be misused, allowing fake identities to deceptively influence opinions within social media clusters. [3] The goal of this research is to determine whether news is fake or not using both English and Hindi text-based news. Given the limited advancements in detecting fake news in Hindi, this project addresses the issue using various research papers. Different classification models will be compared, and a final model using BERT will be proposed. While many fake news detection projects exist for English, identifying fake news in local languages like Hindi faces challenges due to language barriers and lack of datasets. This project aims to overcome these challenges using the BERT model, informed by relevant research and projects, to detect fake news in both languages effectively. As fake news detection systems have become more popular, adversarial models have emerged that bypass algorithmic identification methods to avoid being detected. Individuals deliberately create sophisticated fake news to target and evade these systems. Current detection methods, focusing on linguistic and compositional features, struggle with evolving fake news techniques. Limitations include reliance on keywords, difficulty detecting new forms like deepfakes, and analyzing content in isolation without broader context. To improve detection, our system will incorporate word sentiment, similarity, and users' network relationships, addressing these limitations and adapting to the latest fake news generation styles.

**Keywords:** Fake News, Detection, BERT, Sentiment Analysis, Multilingual

# BIOMEDICAL IMAGE SEGMENTATION AND CLASSIFICATION USING AI

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**Abstract:** Gallbladder diseases pose significant health risks and can lead to severe complications if not diagnosed and treated promptly. Conditions such as gallstones, inflammation, and other abnormalities may result in critical issues like bile duct obstructions, persistent pain, infections, and, in extreme cases, life-threatening sepsis or gallbladder cancer. This study introduces a novel diagnostic framework based on a deep learning architecture—an attention-guided residual convolutional neural network—designed to classify nine different gallbladder conditions. These include gallstones, abdominal and retroperitoneum conditions, cholecystitis, membranous and gangrenous cholecystitis, perforation, polyps with cholesterol crystals, adenomyomatosis, carcinoma, and various causes of gallbladder wall thickening. The model integrates multi-scale feature extraction via dilated convolutions, attention mechanisms for enhanced feature selection, and residual connections to preserve spatial details and mitigate vanishing gradient issues. Experimental results demonstrate the model's robustness, achieving an accuracy of 99.17% and a recall of 98.94%. These outcomes highlight the model's reliability in differentiating among diverse gallbladder pathologies. The proposed approach offers a fast, precise, and scalable diagnostic solution, supporting clinicians in interpreting complex radiological images and enhancing the role of deep learning in advancing medical image analysis.

**Keywords:** Gallbladder Disease Diagnosis, Deep Learning, Attention-guided Residual CNN, Medical Image Analysis, High-Accuracy Classification.

# BIOTRACES: LIVE AUTHENTICATION MODEL

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**Abstract:** This paper presents the design and evaluation of BioTrace, a secure and scalable biometric authentication system that leverages facial and fingerprint recognition integrated with advanced encryption and distributed data management. The system employs Convolutional Neural Networks (CNNs) for real-time feature extraction from biometric inputs, followed by AES-256 encryption to safeguard sensitive data. Encrypted biometric templates are stored in a distributed PostgreSQL database managed via Supabase, ensuring secure, fault-tolerant, and highly available data storage through replication and partitioning strategies. The authentication process involves decrypting stored templates and comparing them with freshly captured data using a similarity metric to determine access rights. Extensive testing was conducted across unit, integration, and system levels. Experimental results demonstrate high accuracy (99.2% for fingerprints, 98.7% for facial recognition) with minimal encryption latency. Load testing confirmed system scalability under concurrent usage, while security assessments revealed no critical vulnerabilities. Compliance with GDPR and CCPA was verified, highlighting the system's commitment to privacy and user data protection. BioTrace offers a robust solution for secure digital identity verification in modern applications.

**Keywords:** Biometric authentication, Facial recognition, Fingerprint recognition, Data encryption, System scalability

# BLINDASSIST: OBJECT DETECTION FOR THE VISUALLY IMPAIRED

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**Abstract:** Visually impaired people experience a lot of difficulties in identifying and evading objects in their surroundings, which significantly affects their safety, mobility, and general independence. We present BlindAssist, an indoor object recognition system that helps visually impaired users by identifying objects in real-time and giving auditory feedback that states the object's name and the direction. To improve the detection capabilities, we propose GCBAM-RepNCSPELAN, a specialized module that integrates both Ghost Bottleneck and CBAM, effectively replacing the standard RepNCSPELAN module in the YOLOv9s architecture's backbone. Our customized YOLOv9s model based on GCBAM-RepNCSPELAN has achieved an improvement in mAP50 of 10.76% and an improvement in mAP50-95 of 11.27%, representing significant increases in detection precision. In addition, to further make this technology more practical and accessible, we have created an Android app that extends BlindAssist's functionality to mobile devices, offering real-time object detection and directional audio guidance directly to users. Our findings demonstrate the high potential of using Ghost convolution and attention mechanisms for assistive navigation technologies.

**Keywords:** Visually Impaired, Object Recognition, GCBAM, YOLOv9s, Android App, Assistive Technology

# BLINDVIZ – INTELLIGENT NAVIGATION AND ENVIRONMENTAL AWARENESS FOR VISUALLY IMPAIRED

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**Abstract:** BlindViz is an AI-powered mobile application developed to assist blind and visually impaired individuals by providing real-time object detection and scene description. It combines advanced technologies such as YOLOv8 (You Only Look Once version 8) for object detection, EasyOCR (Easy Optical Character Recognition) for reading text from the environment, and image segmentation for understanding spatial context. These inputs are processed using a Large Language Model (LLM) to generate clear, natural language descriptions. Activated by the voice command "Activate," the app captures an image through the camera, processes it, and delivers an audio description to the user. BlindViz is optimized for mobile devices with a voice-driven interface for ease of use and accessibility. It has shown promising results in improving users' awareness and confidence in various real-world environments. Future enhancements include gesture-based controls, GPS integration, multilingual support, and cloud-based processing for complex scenes. BlindViz offers a practical and empowering tool that enhances independence and interaction with the environment for blind and visually impaired users.

**Keywords:** Object Detection, LLMs, YOLOv8, OpenAI API, Natural Language Processing.

# BLOCKCHAIN FOR SECURE TRANSFER OF DATA IN HCX SYSTEM

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**Abstract:** The secure exchange of health data across systems and organizations remains a critical challenge in modern healthcare, especially in the context of interoperability initiatives like the Health Claim Exchange (HCX) protocol. Conventional health information systems, often built on centralized architectures, expose sensitive medical data to significant risks, including unauthorized access, data breaches, and system-wide failures due to single points of control. In response to these challenges, this paper presents a decentralized health data exchange model that integrates blockchain technology with advanced encryption mechanisms and a modern web application framework. Our proposed system leverages blockchain's distributed ledger capabilities to eliminate centralized control, ensuring that all transactions and data modifications are securely recorded, immutable, and verifiable across all participating nodes. To further protect the confidentiality of medical records during transfer and storage, the model incorporates JSON Web Encryption (JWE), allowing sensitive payloads to be encrypted at the application layer using compact, standards-compliant cryptographic structures. This ensures that even in a distributed environment, only authorized recipients can decrypt and access the data.

**Keywords:** Encryption, HCX Protocol, Decentralized System, JSON Web Encryption, Medical Records

# BODYBUDDY: ENHANCING EXERCISE ACCURACY THROUGH REAL TIME FEEDBACK

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**Abstract:** BodyBuddy is an AI-driven system designed to enhance exercise accuracy through real-time posture correction. Using Spatio-Temporal Graph Convolutional Networks (ST-GCN) and MediaPipe, it analyzes user poses and provides immediate feedback via Augmented Reality (AR). This real-time feedback system aims to reduce injury risks and improve exercise efficiency by ensuring that users maintain proper form during workouts. This research focuses on the application of advanced AI and computer vision technologies to develop a user-friendly platform for exercise correction. BodyBuddy is particularly useful for beginners and athletes, helping them perfect their exercise form with real-time guidance and minimize the likelihood of injury

**Keywords:** Real-time posture correction, Spatio-Temporal Graph Convolutional Networks (ST-GCN), Augmented Reality (AR), Exercise efficiency, Computer vision

# BRAIN TUMOR DETECTION AND SEGMENTATION USING MACHINE/DEEP LEARNING

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**Abstract:** Brain tumors are among the most complex and challenging medical conditions to diagnose due to their variability in appearance. Accurate and timely detection is crucial for effective treatment planning and patient outcomes. This study proposes a robust method for brain tumor detection utilizing a combination of machine learning, deep learning, and metaheuristic optimization techniques. The methodology includes preprocessing MRI images using noise-reducing filters such as mean, median, and Gaussian filters. Tumor regions are segmented using advanced techniques like Otsu thresholding and controlled watershed methods. Feature extraction methods such as GLCM, GLRM, GLDM, LBP, and SIFT are employed, and optimal features are selected using metaheuristic algorithms like WOA, RDA, and GWO. These features are then classified using machine learning models, including ANN and KNN. The effectiveness of the proposed approach is evaluated using metrics such as accuracy, precision, recall, and AUC. The integration of metaheuristic algorithms enhances feature selection, improving classification accuracy and computational efficiency. This research aims to contribute to an optimized framework for brain tumor detection, advancing diagnostic capabilities in medical imaging.

**Keywords:** Brain tumor detection using machine learning, deep learning, metaheuristics, MRI preprocessing, feature extraction.

# BREAST CANCER DETECTION USING MRI IMAGES

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**Abstract:** Abstract—Breast cancer is a widespread form of cancer This is derived from breast tissue cells. Timely identification is essential, and MRI serves as a key instrument for achieving this. A biopsy is recommended for lesions with a malignancy risk exceeding 2%, yet only a small fraction of these are verified as malignant. Magnetic Resonance Imaging is utilized to reduce unnecessary biopsies, yet it is a complex and lengthy procedure that demands expert knowledge. A computer-aided diagnostic system utilizing MRI images was created to enhance breast cancer diagnosis. In comparison to seven recent advanced methods,( 2 Conv + 1 Dense, 5 Conv + 2 Dense, 4 Conv + 2 Dense, GoogleNet , ME-CNN, DCNN, DMRBNet ) AMSFNet showed better performance on the dataset. AMSFFnet (Adaptive Multi-Scale Feature Fusion Network) is a deep learning model specifically developed for breast cancer detection using MRI images. The model is designed to effectively capture both intricate details and broader contextual patterns by integrating multi-scale feature extraction, attention mechanisms, and feature fusion techniques. A key aspect of AMSFFnet is its Adaptive Multi-Scale convolutional layers, which apply varying dilation rates to extract features across different receptive fields. To enhance the relevance of extracted features, the network incorporates a learnable attention mechanism that dynamically adjusts the importance of each scale, ensuring that critical patterns are prioritized for classification. Additionally, AMSFFnet employs feature fusion techniques, combining information from multiple layers through concatenation and global average pooling, preserving essential spatial and contextual features. The final stage of the model consists of a fully connected dense layer with softmax activation, responsible for distinguishing between healthy and cancerous cases. By integrating multi-scale processing with adaptive attention, AMSFFnet achieves enhanced accuracy and robustness, making it a powerful tool for medical image analysis and breast cancer diagnosis.The network's accuracy stands at 99.57%, while the error rate is 0.1005. These results emphasize its promise for use in medical and industrial fields for breast cancer detection Index words— Breast cancer, convolutional neural networks, MRI images, classification, and properties of several scales

**Keywords:** Breast, Cancer, MRI, AMSFFnet, Classification

# CANCER DIAGNOSIS USING MACHINE LEARNING

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**Abstract:** Cancer diagnosis has significantly evolved with the advent of machine learning (ML) and artificial intelligence (AI). This research explores ML techniques in cancer diagnostics, focusing on predictive modeling, image analysis, and genomic data processing. Various ML models, including Support Vector Machines (SVM), Random Forests, and deep learning-based Convolutional Neural Networks (CNNs), have demonstrated high accuracy in tumor classification. The study highlights AI's role in early detection, risk assessment, and personalized treatment planning. Experimental results indicate that XGBoost outperforms other classifiers in colorectal cancer detection, with a 96% accuracy rate. Future work should focus on improving model interpretability, expanding datasets, and integrating ML models into clinical workflows for real-world applications.

**Keywords:** Cancer, Diagnosis, Machine Learning, XGBoost, Classification

# CARECHECK: LUNG CANCER DIAGNOSIS SYSTEM USING AI AND ML

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**Abstract:** Lung cancer is one of the most common cause of death all over the world with some 1.8 million human losses every year. Early detection has greatly improved survival rates. The research paper introduces CareCheck, an AI- based diagnostic system that use machine learning and deep learning techniques to improve the accuracy and efficiency of lung cancer detection. Our study has investigated the issues of data imbalance, scalability, interpretability of models, and clinical integration. CNN, SVMs, and ensemble learning techniques, are instruments essential in CareCheck obtaining a high classification accuracy. Assessment criteria such as recall, precision, F1 score, and ROC-AUC show its performance against traditional diagnostic methods. The layered system of CareCheck is a distinctive but very adaptable to many datasets and hospital environments that can be easily scaled up to be used in clinical applications. This paper illustrates the potential of AI in diagnostics that are clinical in nature, and it opens up new areas of research in automated cancer detection. CareCheck is designed to produce lung cancer diagnostics that are more accessible, reliable, and delay-free universally.

**Keywords:** Lung, Cancer, AI, Detection, Classification

# COLD CHAIN INTELLIGENCE WITH DIGITAL TWINS

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**Abstract:** The food industry is constantly struggling to keep perishable products like fruits and vegetables fresh, safe, and high-quality. Digital twin technology helps us to provide solution that offer real-time insights and proactive management. Digital twin technology is fueled by advancements in IoT (Internet of Things), artificial intelligence, and big data. By creating virtual replicas of physical products, it allows us to continuously monitor their condition giving us a smarter, more responsive way to manage perishables. To develop an accurate monitoring system, we collected images of apples, bananas, tomatoes, capsicum, cucumber, mango and orange to create a custom dataset. Using this, we trained a multimodal framework, achieving a Validation MAE of 2.53 and a Validation MAPE of 8%, effectively capturing the complexities of perishable goods.

**Keywords:** Digital Twin, IoT (Internet of Things), Artificial Intelligence, Big Data, MAE, MAPE

# COLORIZATION OF IMAGES USING DEEP LEARNING

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**Abstract:** This project focuses on designing a deep learning-based model for automatic image colorization using a hybrid autoencoder-discriminator architecture. The primary objective is to bring grayscale images to life by generating realistic, vivid colors while preserving the original structure and intricate details. The autoencoder is responsible for capturing essential spatial and contextual features, while the discriminator refines the outputs by promoting the generation of more natural and believable colorizations. To optimize performance, the model combines L1 loss, ensuring pixel-level accuracy, with adversarial loss, enhancing the realism of the results. Various techniques, such as data augmentation, skip connections, and dropout, were incorporated to improve generalization capabilities and reduce visual artifacts. The proposed model achieved a PSNR of 26.04, surpassing several established baseline methods. It effectively mitigates common issues like color bias, dullness, and unnatural shading. However, challenges such as minor color bleeding and inaccuracies in complex regions still offer opportunities for further enhancement.

**Keywords:** Image Colorization, Deep Learning, Autoencoder, Discriminator

# COMPARISON OF MODELS FOR CXR DIAGNOSIS OF PNEUMONIA

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**Abstract:** In order to identify the best model for forecasting particular medical disorders, we compare and evaluate the performance of many machine learning (ML) and deep learning (DL) models using a dataset of chest x-ray images. The models used include sophisticated DL architectures like Convolutional Neural Networks (CNN), Transformers, and multi-layer perceptrons (MLP), as well as more conventional ML approaches like Logistic Regression and Support Vector Machines (SVM). Explainable AI (XAI) techniques such as Gradient-weighted Class Activation Mapping (GRAD-CAM), SHapley Additive exPlanations (SHAP), and Local Interpretable Model agnostic Explanations (LIME) will be used to improve model interpretability and offer insights into the decision-making processes. A wide range of evaluation criteria, including as F1-score, accuracy, precision, and recall, will be used to evaluate each model's performance. The study attempts to determine the best model for correctly detecting diseases from chest x-ray pictures by methodically evaluating these metrics. Incorporating XAI approaches will provide a transparent and reliable solution for medical diagnosis by validating model predictions and highlighting the crucial areas in the x-ray pictures that affect the models' judgments.

**Keywords:** Medical, Diagnosis, Machine Learning, XAI, Chest X-ray

# COMPREHENSIVE ASSET SURVEILLANCE AND PREDICTION MODELLING USING REAL -TIME DATA ANALYTICS

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**Abstract:** Digitalisation and Globalisation highlights the importance of developing more advanced and secure asset tracking and management systems. Indoor asset tracking is crucial in various sectors so as to track valuable assets for their efficient management and real-time monitoring. This report displays the utilization of low-cost, and energy efficient BLE device i.e. Seeed Studio XIAO nRF52840 in designing and implementation of an indoor asset tracking system. It is configured with the help of an Arduino to advertise BLE signals. It serves as the core of the system's tracking functionality which enables the wireless communication between an asset and a receiver through an android or desktop application. These applications scan and detect all the available BLE beacons and then determine the proximity of an asset based on the Received Signal Strength Indicator (RSSI) values. The proximity differs from the near to far based upon the RSSI values. The user-friendly interface of the application allows the user to efficiently manage and monitor their assets. The report describes the system architecture, communication protocols and software integration, along with the creation of an Android application that serves as an interface with the hardware to receive data. This study practically demonstrates that Seeed Studio XIAO BLE nRF52840 based asset tracking utility is redefining asset management system for indoor environment with its real-time monitoring, low power consumption and cost effectiveness. With its scalable, sustainable and efficient design this technology ensures operation efficiency, minimum asset losses by incorporating advanced features such as geofencing, RF tags-based proximity tracking for indoor environment, AI/ML algorithms for superior accuracy. This powerful combination positions smart asset management as a game changer in today's fast paced world.

**Keywords:** Asset, Tracking, BLE, Proximity, IoT

# COMPUTATION AND COMMUNICATION EFFICIENT ATTRIBUTE BASED PRIVACY PRESERVING ACCESS CONTROL MECHANISM IN PUBLIC CLOUD

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**Abstract:** As cloud computing expands rapidly, safeguarding user information from unauthorized access and computational inefficiencies is crucial. This study introduces an effective privacy-preserving algorithm designed to protect sensitive data of cloud users while reducing computational demands. Furthermore, we suggest an efficient broadcast group key management system to enhance key updates during changes in group membership, alleviating the load on the data owner. Our method utilizes advanced cryptographic strategies to improve security while maintaining low communication and storage complexity. To assess the suggested methodology, we carried out performance assessments and security evaluations, showing notable enhancements in computational efficiency and privacy safeguarding relative to current models. The findings demonstrate that our approach lowers key update expenses, lessens the data owner's workload, and improves scalability in dynamic cloud settings. This study enhances the creation of secure and scalable cloud computing frameworks by tackling privacy issues and improving key management effectiveness, thereby ensuring better data security while minimizing resource use. Our results offer important perspectives for upcoming improvements in cloud security.

**Keywords:** Cloud, Privacy, Cryptography, Key Management, Security

# CONTENT ANALYSIS, EXTRACTION AND AUTOMATED VIDEO EDITS WITH WEB SCRAPING AND AI

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**Abstract:** The project aims to automate the end-to-end workflow of managing video content on YouTube by downloading videos from a specific channel, editing them into a reel format, and uploading them to social media platforms. It focuses on making content creation easier and more accessible for individual creators. The system uses the YouTube Data API to retrieve and analyze video data, Pytube for video downloading, and MoviePy for advanced video editing. Additionally, it incorporates artificial intelligence to enhance the editing process, particularly through AI-driven caption generation and video summarization. This automated process significantly reduces manual effort, allowing creators to streamline their video content production and meet the growing demand for short-form content. By integrating AI, the project enables more sophisticated content transformations, such as automatic scene detection, intelligent cropping, and AI-generated captions that boost viewer engagement and accessibility. Overall, the project empowers creators with efficient tools to produce high-quality, engaging content with minimal effort, helping them stay competitive in the evolving digital landscape.

**Keywords:** Video, Automation, YouTube, AI, Editing

# CREDIT CARD FRAUD DETECTION USING MACHINE LEARNING

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**Abstract:** In today's digital age, the financial sector faces heightened risks from cyber threats, particularly credit card fraud. With the rise in cashless transactions, traditional rule-based systems struggle to keep up with evolving fraud tactics. This report presents the development of SVM-FINSEC, a hybrid machine learning model designed for robust and real-time fraud detection. Integrating Support Vector Machines, Random Forests, and Boosting algorithms, the model leverages behavioural biometrics, transaction analysis, geolocation tracking, and phishing pattern recognition. It also addresses class imbalance using SMOTE and employs ensemble learning to improve accuracy and generalization. The model is trained and evaluated using the European Credit Card Fraud Dataset and the PaySim dataset, which mimics mobile money transactions. Key steps included preprocessing, normalization, feature selection, and hyperparameter tuning. SVM-FINSEC achieved a 98.5% accuracy, 97.5% precision, and 96.2% recall—outperforming conventional models while significantly reducing false positives. Deployment involved API integration, Docker containerization, and an intuitive Streamlit-based front end. The solution demonstrates strong resistance to phishing, identity theft, skimming, and account takeovers, making it highly adaptable for modern financial ecosystems.

**Keywords:** Fraud, Detection, SVM, Machine Learning, Security

# CRIME RATE PREDICTION USING MACHINE LEARNING

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**Abstract:** Crime prediction is a crucial application of artificial intelligence, enabling law enforcement agencies to anticipate criminal activities and allocate resources efficiently. Traditional crime analysis methods often rely on statistical models that fall short in handling complex, large-scale datasets. This research presents a machine learning-based system that uses historical crime data, spatiotemporal patterns, and police deployment information to classify crime types and predict future incidents. The system employs a Random Forest Classifier for crime classification and Polynomial Regression for forecasting crime rates. Data preprocessing includes extracting temporal features, encoding categorical variables, and removing outliers to optimize performance. Evaluation metrics such as accuracy, precision, recall, and RMSE are used to assess model effectiveness. Results show that Random Forest achieves 85% accuracy in crime classification, while Polynomial Regression attains a 78% $R^2$ score in trend forecasting. The system is deployed as an interactive GUI application using Streamlit, offering a user-friendly interface for law enforcement. The study also considers ethical concerns like bias mitigation and legal issues in AI-based crime prediction. Future work may explore deep learning models, real-time data integration, and cloud deployment to enhance system capabilities.

**Keywords:** Crime, Prediction, Machine Learning, Classification, Forecasting

# CUSTOMER CHURN PREDICTION FOR A SUBSCRIPTION SERVICE

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**Abstract:** This research analyses how machine learning helps estimate user turnover in subscription-based services, a crucial issue for company stability and development. Customer churn—subscriber cancellations—has a major impact on revenue and company success. Definition, significance, and repercussions of customer turnover in subscription-based business models are covered. This study will cover churn prediction methods, focusing on current machine learning and data analytics advances. Using data from a popular subscription service, many machine learning algorithms were tested. Models are assessed by accuracy, precision, recall, and F1 score. Finally, the models are compared, the merits and flaws are addressed The study subsequently discusses how predictive models may be incorporated into business processes, including their practical uses and typical problems. The entire strategy helps firms use data-driven insights to decrease churn Conclusions from this paper will help firms adopt a churn prediction model for their needs and implement successful targeted interventions and retention efforts. This research uses sophisticated analytics on real-world data to understand customer turnover and provide practical advice for subscription-based service customer loyalty. Keywords: churn, prediction, machine learning, retention, subscription-based

**Keywords:** Churn, Prediction, Machine Learning, Retention, Analytics

# DECENTRALISED IDENTIFY MANAGEMENT SYSTEM USING BLOCKCHAIN

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**Abstract:** This project presents a decentralized identity management system for secure and scalable Know Your Customer (KYC) verification in the banking sector. Built on blockchain, it ensures tamper-proof data integrity, user-controlled access, and compliance with privacy regulations. Smart contracts, Decentralized Identifiers (DIDs), and Verifiable Credentials (VCs) are utilized to replace centralized identity databases with a transparent and privacy-preserving system.

**Keywords:** Identity, Blockchain, KYC, Decentralized, Privacy

# DECENTRALIZED BANKING USING BLOCKCHAIN AND WEB DEVELOPMENT

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**Abstract:** This project presents a Decentralized Banking System utilizing blockchain technology to eliminate the need for intermediaries in financial transactions. Built on the Ethereum Testnet, the system allows wallet-to-wallet monetary transfers through smart contracts written in Solidity and deployed via Hardhat. User interaction is handled through a seamless web interface developed using ReactJS and NextJS, with Metamask integration ensuring secure authentication and transaction signing. Our experiments successfully demonstrated the transfer of assets between simulated banks with transaction confirmation times under 2 seconds. The platform currently supports Ethereum-based transactions but is designed for future expansion to multiple blockchain networks, allowing users to send and receive various cryptocurrencies. Upcoming enhancements include direct crypto-to-crypto exchanges managed automatically by smart contracts, providing a frictionless experience without user intervention. This decentralized approach empowers users with full ownership of assets, enhances transparency, and reduces operational costs. The results underline the potential of blockchain to redefine conventional banking systems, paving the way for more inclusive, efficient, and secure financial ecosystems.

**Keywords:** Banking, Blockchain, Ethereum, Smart Contracts, Decentralized

# DECENTRALIZED VOTING SYSTEM WITH BLOCKCHAIN

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**Abstract:** This research explores the development of a secure and decentralized online voting platform using blockchain technology. Traditional voting systems— both manual and electronic—have long been plagued by issues such as tampering, voter fraud, limited transparency, and centralized control. By leveraging blockchain's decentralized architecture and immutable ledger, this study proposes a more reliable, transparent, and tamper-resistant alternative to conventional electoral processes. The system integrates smart contracts to automate core functionalities like voter registration, ballot submission, and vote tallying. It ensures vote integrity, prevents double voting, and maintains voter anonymity using advanced cryptographic methods, including zero-knowledge proofs and homomorphic encryption. The platform is designed for accessibility across web and mobile interfaces, offering scalable and verifiable elections suitable for a wide range of democratic settings. Although the model significantly enhances transparency and reduces human intervention, challenges remain—particularly in the areas of legal compliance, user accessibility, and large- scale performance. Through practical implementation and testing, this paper demonstrates the feasibility of blockchain for modern electoral systems and outlines future enhancements to address current limitations.

**Keywords:** Voting, Blockchain, Security, Smart Contracts, Transparency

# DEEP LEARNING BASED CARDIAC HEALTH ABNORMALITY ASSESSMENT

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**Abstract:** Cardiovascular diseases (CVDs) are the leading cause of death globally, accounting for approximately 17.9 million deaths each year. Early diagnosis is essential for reducing mortality and improving patient outcomes. However, traditional diagnostic methods are often manual, time-consuming, and prone to errors, especially in resource-limited environments. This research presents a Machine Learning (ML)-based system designed to predict heart disease risk by analyzing health, demographic, and lifestyle factors. The dataset includes variables such as body mass index (BMI), physical activity, smoking, alcohol consumption, diabetes history, sleep patterns, and overall health status. Four classification algorithms Logistic Regression, K-Nearest Neighbours (KNN), Random Forest, and Decision Tree were trained and evaluated using accuracy, precision, recall, and F1-score. A Streamlit-based Graphical User Interface (GUI) enables users to input their health data and receive an immediate risk assessment. Exploratory Data Analysis (EDA) and SHAP (SHapley Additive exPlanations) were used to identify critical features and enhance model explainability, ensuring transparent decision-making.

**Keywords:** Cardiovascular, Machine Learning, Risk, Diagnosis, Classification

# DEEP LEARNING BASED HANDS FREE NAVIGATION

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**Abstract:** The design and evaluation of mouse cursor control systems based on face movements are essential for improving accessibility for individuals with disabilities. With advancements in technology, detecting and using eye movements and facial expressions to interact with computers has attracted considerable attention. This study provides a detailed review of existing methods for tracking facial movements and using them to control a cursor. By examining the strengths and weaknesses of current models, we identify key challenges such as accuracy, adaptability, and ease of implementation. The effectiveness of different approaches is evaluated across various scenarios, using specific metrics like precision, user response time, and system flexibility. This research not only assesses the performance of these systems but also identifies areas where improvements are needed. The ultimate goal is to emphasize the development of innovative and inclusive technologies that cater to users with restricted mobility, enhancing their ability to interact with digital environments and promoting greater accessibility.

**Keywords:** Cursor, Face, Accessibility, Eye Tracking, Disability

# DEEP LEARNING BASED HUMAN ACTIVITY RECOGNITION FOR SPORTS AND FITNESS PERFORMANCE ENHANCEMENT

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Abstract: This report outlines the creation and implementation of a Deep Learning-Based Human Activity Recognition (HAR) system designed to enhance performance in sports and fitness activities. By leveraging advanced methodologies, particularly the hybrid 3D CNN-LSTM architecture, the project aims to accurately classify and recognize complex human movements. The significance of using high-quality, ethically sourced datasets is emphasized, with a focus on various cricket shots and yoga poses, ensuring a solid foundation for model training while adhering to ethical standards. The preprocessing techniques employed were vital in preparing the data for training, involving the removal of noise, extraction of meaningful features, and ensuring a balanced representation of activities. Exploratory data analysis provided valuable insights into the dataset's characteristics, guiding the model development process. The advanced model has proven to be promising with its performance, thus giving testimony to the applicability of deep learning techniques in real-world scenarios. The system offers real-time feedback, which is crucial for improving training outcomes for athletes and fitness enthusiasts alike. By tailoring the HAR system to meet the needs of various activities, the project highlights the potential for personalized and actionable guidance. In summary, this report underscores the transformative capabilities of deep learning-based HAR technologies in the sports and fitness sectors, presenting a reliable tool for performance enhancement. The findings and methodologies outlined serve as a foundation for future advancements in HAR systems, aiming to create even more sophisticated and user-friendly solutions for enhancing human activity recognition.

Keywords: Activity, Recognition, Deep Learning, Sports, Fitness

# DEEP LEARNING BASED VISUAL QUESTION ANSWERING

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Abstract: Visual Question Answering (VQA) using deep learning methods is enhancing human-computer interactions by allowing systems to interpret visual scenes and respond to text-based questions. This thesis focuses on fine tuning a VQA system based on Florence-2, a large-scale transformer-based Vision-Language Model (VLM) for remote sensing VQA using the RSVQA dataset. The model uses multimodal input to perform multimodal learning for aligning visual and textual features which aids in contextual understanding and reasoning. Consideration is given to improving model performance, minimizing bias, and usability of VQA in domain settings. The study also acknowledges the rising demand of ethical AI and responsible dataset curation. Finely tuned Florence-2 achieved improved accuracy and contextual awareness that can be used to support VQA systems theoretically and practically in real-world applications like environmental monitoring, land use change analysis, and disaster assessment.

Keywords: VQA, Florence-2, multimodal, remote-sensing, ethical-AI

# DEEP LEARNING DRIVEN STOCK PREDICTION AND AUTOMATION

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Abstract: This research presents an automated stock trading system leveraging deep learning models to predict price movements and execute trades. The study integrates advanced neural network architectures, su ch as the Probabilistic Spatio Temporal Model (PSTM) and Patch Time Series Transformer (PatchTST), with MetaTrader's Expert Advisor (EA) for automated execution. Utilizing forex market and stock data from Metatrader 5 , the system is designed to enhance trading efficienc y by reducing human bias and leveraging real time analytics. The results demonstrate the efficacy of deep learning in stock prediction, highlighting its advantages over traditional trading methods.

Keywords: stock-trading, deep-learning, PSTM, PatchTST, MetaTrader

# DEEP LEARNING-BASED SIGN WORD DETECTION AND INTERPRETATION

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Abstract: Sign language recognition is essential for enabling communication between the deaf-mute community and the broader population, helping to bridge significant communication barriers. Current techniques tend to use expensive sensors or custom hardware, but this research provides a low cost, AI approach to sign language recognition using video input. An AI model has been proposed in this work that utilizes a self-curated dataset of 14 essential gestures, designed to capture a wide range of commonly used expressions, and employs an LSTM network enhanced with an attention mechanism to capture temporal dependencies. This method allows the model to concentrate on the key frames in the gesture sequences, and can recognize much better, without having to have a lot of processing power. The proposed model achieved an accuracy of 92.1% across 14 gesture classes, demonstrating the feasibility of an efficient and accessible sign language recognition system. This work provides a foundational step toward accessible communication tools for the deaf-mute community, encouraging broader adoption through mobile and low-cost devices.

Keywords: Sign Language Recognition, LSTM, Gesture Recognition, AI, Attention Mechanism

# DEEP LEARNING MEETS EEG: A BREAKTHROUGH IN SLEEP PATTERN DETECTION

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Abstract: Sleep stage classification is essential for understanding sleep patterns and detecting disorders such as insomnia and sleep apnea. This research leverages the Sleep-EDF dataset and applies deep learning and time-series modeling techniques to classify sleep stages using EEG recordings. The study employs preprocessing techniques including bad channel detection, Independent Component Analysis (ICA) for artifact removal, and Fast Fourier Transform (FFT) for spectral analysis. The classification model integrates convolutional neural networks (CNNs) and long short-term memory (LSTM) networks to enhance accuracy. Evaluation metrics such as accuracy, precision, recall, F1-score, and Cohen's Kappa coefficient validate the model's performance. The findings highlight the effectiveness of FFT-based spectral analysis in distinguishing delta, theta, alpha, and beta frequency bands, critical for sleep classification. The results show high classification accuracy for wake and REM stages, with minor misclassifications in N1 and N2 transitions. This study demonstrates the potential of deep learning for automated sleep monitoring and early abnormality detection.

Keywords: sleep-classification, EEG, deep-learning, FFT, LSTM

# DEEPFAKE DETECTION IN BIOMETRIC SYSTEM (FACE SPOOFING)

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Abstract: The rise of artificial intelligence, particularly deep learning, has enabled the creation of deepfakes—highly realistic forgeries of images and videos. These pose serious threats to biometric security systems, especially facial recognition, by facilitating face spoofing, leading to identity theft and unauthorized access. This project aims to develop an advanced deepfake detection system to safeguard biometric authentication. The approach involves collecting a dataset of real and deepfake facial images, followed by preprocessing for consistency. Key features will be extracted using advanced image processing techniques, and deep learning models, including Convolutional Neural Networks, will be implemented. Performance metrics such as accuracy, precision, recall, and F1-score will be used for evaluation. Additionally, the project will focus on deploying the model on a UI interface using Streamlit, where users can directly upload an image, and the system will predict whether it is a deepfake or real. Ensuring scalability and reliability, this system aims to strengthen biometric security by accurately identifying deepfakes, mitigating threats, and contributing to cybersecurity advancements.

Keywords: deepfake, biometric-security, CNN, face-spoofing, cybersecurity

# DEEPFAKE IMAGE AND FORGED SIGNATURE DETECTION USING MACHINE LEARNING

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Abstract: As digital forgeries become increasingly sophisticated, the need for robust detection methods has grown critical. This research focuses on developing an AI-powered system to detect deepfake images and forged signatures, addressing security concerns in identity verification and digital media authentication. The purpose is to enhance fraud detection capabilities by leveraging machine learning techniques tailored for image and handwriting analysis. The deepfake detection model employs a multi-phase training approach, integrating advanced feature extraction and anomaly detection to distinguish manipulated images from real ones. Meanwhile, the signature forgery detection model adopts a person-specific learning strategy, training exclusively on genuine signatures to identify forged ones with high precision. Extensive testing revealed promising accuracy improvements, emphasizing the impact of adaptive learning mechanisms and fine-tuned preprocessing techniques. Our findings highlight the potential of AI in enhancing digital security and authentication processes. This research contributes to the fight against fraudulent activities, offering a scalable and reliable solution for banking, forensics, and digital content verification.

Keywords: : deepfake-detection, signature-forgery, AI-security, anomaly-detection, fraud-detection

# DEGRADED SCRIPT IDENTIFICATION OF GUJARATI AND PUNJABI

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Abstract: With a focus on Gujarati and Gurmukhi scripts, this paper provides a comprehensive and in-depth examination of the latest techniques for detecting degraded script in Indian document images. It presents a thorough analysis of the numerous challenges encountered in document processing due to degradation, including noise, skew, and segmentation errors, while evaluating state-of-the-art methods designed to overcome these obstacles. The review extensively discusses preprocessing techniques such as adaptive binarization, skew detection and correction, and noise elimination, which play a crucial role in enhancing script recognition. Furthermore, the paper explores advanced feature extraction methodologies that integrate both structural and statistical attributes, ensuring a robust representation of the script. Additionally, it investigates various classification approaches, including neural networks, support vector machines, and k-nearest neighbors, along with sophisticated segmentation algorithms for isolating lines, words, and individual characters. The findings suggest that OCR accuracy for degraded Gujarati and Gurmukhi scripts can be significantly improved by adopting an integrated approach that optimally combines these advanced techniques.

Keywords: script-recognition, degradation, preprocessing, OCR, feature-extraction

# DEGRADED SCRIPT IDENTIFICATION OF HINDI AND SANSKRIT

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Abstract: Scripts are a primitive medium for preserving linguistic and cultural heritage, and Hindi and Sanskrit are used widely in ancient manuscripts and historical documents. However, the majority of these texts are deteriorated because of aging, ink deterioration, smudging, broken characters, and noise, and thus identification and recognition become very challenging. Degraded script recognition is essential for restoration and digitization of such documents, but current approaches fail with intricate ligatures, overlapping strokes, and handwriting variations. Although computational methods have enhanced recognition to a certain degree, highly degraded documents remain formidable challenges. Tighter solutions need to be created for enhancing text recognition, segmentation, and restoration via increased research. This article examines the complexity of script degradation identification, critiques available challenges, and emphasizes the demand for improved methodology to facilitate successful preservation and digitization of Sanskrit and Hindi manuscripts. A blend of machine learning models and image processing techniques is essential to overcome these shortcomings. Additionally, the incorporation of feature extraction methods and pattern recognition algorithms can greatly enhance degraded script identification

Keywords: degraded-script, recognition, manuscript-preservation, feature-extraction, machine-learnin

# DERMATOLOGICAL DIAGNOSIS USING XAI

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Abstract: Dermatological diseases pose a global health challenge, often requiring expert evaluation for accurate diagnosis. This research addresses the need for an AI-driven diagnostic system that enhances accuracy and transparency in skin disease classification. The primary objective is to develop a model that not only classifies dermatological conditions but also explains its decisions, making AI more interpretable for clinical use. To achieve this, Inception V3 was utilized for feature extraction, while Grey Wolf Optimization (GWO) selected the most relevant features to improve efficiency. A curated dataset underwent preprocessing, augmentation, and balanced splitting for optimal model training. LIME (Local Interpretable Model-agnostic Explanations) was incorporated to enhance transparency by visualizing key features influencing predictions. Results demonstrated improved classification accuracy and interpretability, making AI-driven dermatological diagnosis more reliable. This study highlights the importance of integrating deep learning, optimization algorithms, and XAI for trustworthy medical AI. Future work will focus on dataset expansion and clinical validation.

Keywords: Dermatology AI, Inception V3, Grey Wolf Optimization, Explainable AI (XAI), LIME

# DESIGN AND DEVELOPMENT OF A MAITHILI SPEECH RECOGNITION SYSTEM USING DEEP LEARNING

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Abstract: Automatic Speech Recognition (ASR) for low-resource languages like Maithili is crucial for linguistic inclusivity. This research fine-tunes OpenAI's Whisper model to transcribe Maithili speech, addressing its absence in Whisper's original training data. We curated a dataset of Maithili audio-text pairs and applied data augmentation techniques such as spec-augmentation and pitch-loudness adjustments to enhance training diversity. Various hyperparameter configurations were explored to optimize performance. The fine-tuned model demonstrated improved transcription accuracy, achieving a loss of 0.2–0.3 and a Word Error Rate (WER) of 45%–55% across different testing datasets. These results indicate the effectiveness of fine-tuning in adapting ASR models for underrepresented languages. This work not only advances Maithili speech recognition but also underscores the potential of Whisper in extending ASR capabilities to other low-resource languages, fostering greater accessibility and linguistic preservation. Furthermore, the insights gained from this study can aid future research in optimizing ASR models for similar languages. By bridging this technological gap, our approach contributes to digital inclusivity for Maithili speakers.

Keywords: Maithili ASR, Whisper Fine-Tuning, Low-Resource Languages, Speech Recognition, Word Error Rate.

# DESIGN AND DEVELOPMENT OF HINDI, MAITHILI AND BENGALI PRE TRAINED TRANSFORMER

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Abstract: This paper presents the design and development of a pre-trained transformer model for Hindi, Bengali, and Maithili languages. Leveraging Byte Pair Encoding (BPE) tokenization, the model efficiently handles the unique morphological characteristics of these languages while significantly reducing vocabulary size. The training process is divided into three distinct phases to optimize memory usage and computational efficiency. In the first phase, the model is pre-trained on shorter context sentences (50–100 tokens) to capture fundamental linguistic patterns with minimal resource overhead. In the second phase, the decoder is pre-trained using larger contexts (approximately 512 tokens), enhancing its ability to model long-range dependencies. Finally, the pre-trained decoder's weights are integrated into a full encoder–decoder architecture, which is then fine-tuned for neural machine translation. Additionally, a weighted balanced loss function is employed to emphasize three critical aspects of translation: sparse categorical cross entropy, masked cross entropy, and a focused loss component targeting rare token prediction. This phased training strategy, coupled with the custom loss function, enables the model to efficiently learn from diverse linguistic data in resource-constrained environments, offering a robust solution for low-resource language translation.

Keywords: transformer-model, language-translation, BPE, encoder-decoder, low-resource

# DESIGN AND IMPLEMENTATION OF DEEP LEARNING ALGORITHMS FOR AUTOMATIC GRADING OF STUDENT'S ESSAY

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Abstract: This project introduces an advanced model to develop an automated deep learning system for evaluating essays, improving accuracy and efficiency by utilizing natural language processing techniques. Transformer-based models, which are effective in handling difficult language tasks, are used in the system. The system assesses various aspects of writing quality, including grammar, coherence, argument strength, and content relevance, by training the model on a diverse dataset of student essays. The project began with comprehensive data preparation and model design, followed by fine-tuning and implementation of the scoring algorithm. Evaluation metrics, such as Mean Squared Error, accuracy, recall, and F1-score, are used to compare the system's performance to human grading criteria. Through iterative testing and validation, the system demonstrated high accuracy of 83% and reliability in generating scores comparable to human evaluators. This development in education evaluation technology could significantly change the way students learn in academic environments. The work not only streamlines the grading process but also contribute towards the integration of AI in education, offering potential for large-scale deployment.

Keywords: essay-evaluation, deep-learning, transformer-model, NLP, automated-grading

# DESIGN AND IMPLEMENTING DEEP LEARNING TECHNIQUES FOR REDUCING TRAFFIC ACCIDENT AND MORTALITY RATE

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Abstract: A major problem on a global scale, traffic accidents cause enormous financial losses in addition to many lives. More sophisticated solutions must be developed because traditional traffic safety measures frequently fall short in their ability to foresee accidents. Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs) are used in this paper's deep learning-based accident prediction model to evaluate both historical and current traffic data. To improve model accuracy, data preprocessing methods like feature engineering, normalization, and outlier detection are used. According to experimental findings, the suggested method greatly enhances accident prediction, allowing for the adoption of preventative safety measures. According to the findings, road safety may be completely transformed by combining AI-driven predictive analytics with traffic management systems. This would enable authorities to foresee and prevent any collisions before they happen, which will ultimately lower the number of fatalities and financial costs. Prediction accuracy can be increased by combining geographical data, IoT devices, and real-time traffic observation. For implementation to be successful, cooperation between engineers, legislators, and AI specialists is essential

Keywords: essay-evaluation, deep-learning, transformer-model, NLP, automated-grading

# DESIGN OF AN EFFICIENT DEEP LEARNING-BASED MODEL FOR DIAGNOSIS OF OSTEOPOROSIS

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Abstract: Osteoporosis is mainly an age related disease which is more prevalent in women than men due to change in hormones. It is caused due to decrease in the estrogen level making the bone fragile and prone to fractures while doing any regular daily chores. Bone Density is measured in terms of T-Score. Normal Bone Density - consists of T-Score from -1 and above. T-Score from -1 to -2.5 is the alarming value indicating the low bone density. While -2.5 and below it, indicates Osteoporosis. Various pre-trained models like DenseNet201, DenseNet121, VGG19, and MobileNetV2 have been implemented on the Dental Periapical Radiograph Dataset. Further various custom models have also been implemented by altering the various parameters and hyper-parameters. AUC and test accuracy can be implemented to test the robustness of the model along with the confusion matrix and classification report. Highest test accuracy among all the custom models is 95.17% and AUC is 99.59% whereas highest test accuracy among the fine-tuned pre-trained model is 94.57% and AUC is 97.68%.

Keywords: osteoporosis, bone-density, DenseNet, radiograph, AUC

# DESIGNING OF AUTONOMOUS DRIVING SIMULATOR

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Abstract: This paper presents an autonomous driving algorithm engineered and executed using Proximal Policy Optimization (PPO) within the Car Learning to Act (CARLA) simulation environment. By keeping in mind, the complexities of Indian roads, such as obstacles or animals on road, unstructured traffic and dynamic conditions, this paper proposes an algorithm designed in a way to adapt these complexities easily. The proposed algorithm prepares a vehicle to be able to work with real world images using the proposed Convolutional Neural Network (CNN) model and generate segmented, labelled images which labels each pixel of the image with a specific class. The RL model is trained on these images which shows that the algorithm is safe and more efficient as compared to the existing work. Through extensive simulations the proposed work shows that the proposed algorithm surpasses most of the existing methods in terms of safety and efficiency. Simulation results shown that the proposed PPO-based framework gain 15% more reward and 20% longer episode duration compared to the prior models, indicating its superior adaptability and robustness.

Keywords: Autonomous Driving, Proximal Policy Optimization (PPO), Reinforcement Learning, CARLA Simulator, Convolutional Neural Network (CNN)

# DETECTION OF DEEPFAKE USING GENERATIVE ADVERSARIAL NETWORKS (GANS)

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Abstract: This study presents a framework for estimating generative models using an adversarial training process. With this approach, two models are developed simultaneously: a generating model (named GG) that aims to learn the underlying data distribution and a discriminative model (called DD) that ascertains whether GG generates a given sample or originated from the real training dataset. The training of GG involves maximizing the probability that DD makes incorrect classifications, establishing a minimax game between the two models. Remarkably, when both GG and DD are implemented as multilayer perceptrons, the system can be effectively trained using the well-established backpropagation algorithm. This development simplifies the training and sampling processes, eliminating the need for complex Markov chains or sophisticated inference networks. Empirical results validate this framework's effectiveness, supported by thorough qualitative and quantitative assessments of the generated samples

Keywords: Generative models, Adversarial training, Discriminative model, Multilayer perceptrons, Back propagation

# DETECTION OF FAKE IMAGE USING DEEP LEARNING

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Abstract: The rapid advancement of the digital media has made it easier to create and share content. However, this progress has also given rise to the significant challenges, particularly with the emergence of the deepfakes in the form of manipulated images or videos. This paper presents a deep learning-based approach for detecting deepfakes by using a hybrid of ResNet-50 and EfficientNet for effective detection of manipulated media. The proposed model is trained on a carefully curated dataset derived from the DFDV dataset, taking 20 frames from each video and utilizing Haar Cascade Classifiers for face detection. The preprocessing methods, such as grayscale conversion, CLAHE, and Canny edge detection helped in improving the feature extraction process. The Hybrid model was trained with data augmentation techniques and Explainable AI (LIME) to provide transparency. The proposed method provides better accuracy and stability than the conventional ResNet-50 based models. The model obtained 95.37% Training Accuracy and 93.89% test accuracy. Hence, this research offers a scalable remedy which is essential for combating the misinformation and ensuring the authenticity of digital content.

Keywords: Deepfake detection, Hybrid ResNet-50 and EfficientNet, Face detection, Explainable AI (LIME), Digital media authenticity

# DEVELOPING AN ONLINE SPORTS PLATFORM USING ANDROID STUDIO

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Abstract: The major objective of this mobile application is to create more interest and enthusiasm in the game in which they are interested into. The user can register themselves into the application and search for the grounds as well as players in their surroundings and opt them in to the game. The application will notify if there is slots available for the user to opt in to the game. There are many features added into the proposed system to make it computationally worth than the state of the art applications.

Keywords: Sports mobile application, Player and ground search, Slot availability notification, User registration, Game engagement

# DEVELOPING DATA-DRIVEN DECISION MAKING MODEL FOR ACHIEVING SDG GOALS FOR SMART CITIES

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Abstract: In the process of promoting sustainable development in urban areas, the inclusion of data-driven decision making systems is rapidly emerging as a significant strategy. The aim of our project is to deliver such a system for Indian Smart Cities to efficiently achieve Sustainable Development Goals. We begin our project by recognizing crucial Sustainable Development parameters that go hand in hand with Smart Cities i.e. clean energy, sustainable infrastructure and healthy community building. It utilises comprehensive dataset from government organizations and uses AHP and entropy to find weights of each parameter and then uses TOPSIS to analyze datasets in order to recognize patterns, correlations and insights that inform decision-making to rank each city in specific domains. Outcome of this project are expected to empower Indian Smart Cities in sustainable development. By integrating this model into governance and planning of smart cities, we work effectively against challenges like rapid urbanization and resource scarcity.

Keywords: Sustainable development, Smart Cities, Data-driven decision making, AHP-TOPSIS analysis, Urban planning

# DEVELOPMENT AND ANALYSIS OF AN AI-DRIVEN SYSTEM FOR AUTOMATED LIVER AND TUMOR SEGMENTATION IN MEDICAL IMAGING USING DEEP LEARNING

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Abstract: Liver segmentation is crucial for medical imaging in order to detect and treat liver-related disorders. Deep learning algorithms have been used to increase the automation and precision of segmentation. CNNs, such as transformer-based models, generative adversarial networks (GANs), and U-Net variants, have demonstrated notable performance improvements among these. Nonetheless, challenges such as interpretability, ethical constraints, and clinical application remain significant. Explainable AI (XAI) has arisen as a groundbreaking resource that provides clarity into model decision-making processes, thus improving clinician confidence and ensuring safe use in medical settings. XAI connects the divide between cutting-edge research and practical clinical application by tackling challenges like training data biases, patient confidentiality, and responsibility. By deployment of interpretable models, AI-assisted liver segmentation becomes ethical and trustworthy while allowing for real-time segmentation and personalized treatment.

Keywords: Liver segmentation, Deep learning, Explainable AI (XAI), Medical imaging, Clinical applicability

# DEVELOPMENT OF AI BASED APPLICATION USING MULTIMODAL DATA

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Abstract: Ayurveda, an ancient and comprehensive medical system, holds vast potential, yet its accessibility remains a challenge due to scattered data sources and the lack of well-structured, extensive literature. Healthcare practitioners often struggle to retrieve and integrate Ayurvedic knowledge effectively, limiting its practical application in modern medicine. Conventional methods fail to organize this knowledge into an easily navigable database, reducing its usability. To address this, we propose a multimodal approach incorporating Retrieval-Augmented Generation (RAG). This system enables efficient, context-driven retrieval of Ayurvedic knowledge by dynamically extracting relevant information from repositories and leveraging advanced AI techniques to generate precise and contextually accurate responses. This hybrid response accounts for highly specific and relevant responses. By utilizing Ayurvedic data from unstructured, publicly available sources, this system is structured around key medical domains, focusing on diseases and their cures as per Ayurveda. Additionally, various techniques were used for faster inference and mapping for more accurate and efficient workflow. This approach overcomes shortcomings like fragmentation and inaccessibility of Ayurvedic data. The scalability of this approach provides future expansion, offering a versatile platform for integrating Ayurvedic principles into modern medical practices. In future expansions a wider dataset with a focus on other aspects of Ayurveda could be included, extending the capabilities to turn it into a more specialized Ayurvedic care for individuals.

Keywords: Ayurveda; Multimodal AI; LoRA; Retrieval-Augmented Generation (RAG); Large Language Model(LLM)

# DIABETES PREDICTION USING MACHINE LEARNING

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Abstract: Diabetes mellitus is a serious illness that affects many people all over the world. Its development is influenced by a number of factors, including age, obesity, sedentary lifestyle, genetic susceptibility, bad eating habits, and high blood pressure. Diabetes patients are more likely to experience consequences such as kidney failure, stroke, heart disease, eye problems, and nerve damage. The standard procedure in hospitals is to do a number of diagnostic tests to obtain the data needed to diagnose diabetes, then develop individualized treatment programs in light of the findings. Because of the enormous amounts of data it contains, big data analytics has become a crucial tool in the healthcare industry. Healthcare practitioners may examine large datasets, find hidden insights, identify trends, and forecast results by using big data analytics. The accuracy of the current categorization and prediction techniques for diabetes diagnosis is low, notwithstanding their usefulness. In order to improve the classification process, this research suggests a diabetes prediction model that takes into account variables other than the standard ones, such insulin, age, BMI, and glucose. In comparison to earlier datasets, the introduction of fresh datasets has improved classification accuracy. In order to further increase classification accuracy, a pipeline model for diabetes prediction has also been implemented.

Keywords: Diabetes prediction, Big data analytics, Healthcare classification, Prediction model, Classification accuracy

# DIABETIC RETINOPATHY DETECTION USING MACHINE LEARNING

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Abstract: Diabetic Retinopathy (DR) is a leading cause of vision impairment worldwide, often characterized by the presence of retinal lesions such as exudates. Hard exudates (HE), which appear as bright lesions in retinal fundus images, are an early and critical indicator of DR, making their accurate detection vital for timely diagnosis and intervention. Despite improvements in medical imaging, creating reliable deep learning models for HE segmentation is largely affected by the scarcity of annotated datasets. Recent studies on classifying the segmentation of sub-lesions in retinal images face a significant challenge due to the limited diversity of datasets. In this study, we propose an approach that combines Generative Adversarial Networks (GANs) for data augmentation with a Recurrent Residual U-Net (R2U-Net) architecture for segmentation. Through the use of GANs, this study addresses the dataset scarcity issue caused by the time-intensive process of manual annotation. The datasets — IDRiD and E-Ophtha — were used to assess our model after it was trained on the IDRiD dataset. Performance comparisons were conducted between models trained on (i) original dataset with no augmentation (ii) original dataset with traditional/offline augmentation, (iii) synthetic dataset made with augmented original dataset and GAN-generated images. The GAN-augmented dataset achieved the best metrics: IoU 0.9319, DSC 0.9435, accuracy 0.9926, sensitivity 0.9554, and specificity 0.9930, surpassing recent literature.

Keywords: Diabetic Retinopathy, Generative Adversarial Networks, Recurrent Residual U-Net, Data Augmentation, Retinal Lesion Segmentation

# DIFFUSIONNET: SEMANTIC IMAGE SEGMENTATION WITH DIFFUSION MODELS

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Abstract: This project aims to develop an advanced system for detecting brain tumors using machine learning techniques. Early detection of brain tumors is crucial for improving patient outcomes, as it allows for timely intervention and better treatment options. Traditional methods like MRIs and CT scans are effective but can be time-consuming and may require expert interpretation, which sometimes leads to delays in diagnosis. Our solution leverages machine learning algorithms to analyze medical imaging data, such as MRI scans, to detect signs of brain tumors quickly and accurately. The system is designed to help healthcare professionals by providing them with a reliable tool for identifying tumors in their early stages. By automating the process of tumor detection, we aim to reduce human error and the time required for diagnosis, allowing doctors to focus on treatment and patient care. The project will use publicly available medical image datasets to train the machine learning model. Once trained, the system will be able to process new MRI scans and predict whether a brain tumor is present or not. Additionally, the system will categorize tumors based on their type, size, and location, providing valuable information to doctors for planning treatment options. This project could play a significant role in improving the early detection and treatment of brain tumors, offering a more efficient, cost-effective solution to a critical healthcare challenge. Ultimately, it aims to enhance the quality of life for patients and support medical professionals in providing better care.

Keywords: Tumor, Detection, Machine Learning, MRI, Healthcare

# DIGITAL INCLUSION AND ACCESSIBILITY IN EDUCATION

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In order to provide the support for efficient and correct knowledge acquisition in different languages, we suggest using a virtual assistant - driven by deep learning models. This system automates processes associated with knowledge retrieval and recommendation entirely allowing users to get relevant and personalized insights with less effort. Using data recognition, feature extraction and hybrid recommendations, the assistant works through the user needs, the pattern of learning and the context to make recommendations. The combination of both collaborative and content-based filtering techniques is integrated in the hybrid recommendation engine for generating personalized learning contents, articles and educational resources. It starts off identifying learning gaps, predicts the potential challenges that the user will face, and suggests the targeted content that will help improve the learning experience of the user. The system also carries out proactive data management and is aware of the user's behaviour and tries to prevent the data from being leaked for protection on user information. The virtual assistant shows experimental results having accuracy range as 88–96%, which exactly makes highly precise predictions and recommendation.

Keywords: Virtual Assistant, Deep Learning, Hybrid Recommendation System, Personalized Learning, Data Privacy.

# DROPSHIP FINDER: WEB SCRAPING FOR E-COMMERCE DISCOVERY

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Abstract: Abstract – The Dropship Finder project is designed to help out in the discovery of new and unique products that are lesser-known through various e-commerce platforms by dropshippers and buyers. This tool enables product discovery through automated wholesaler identification and search results tailored to the demand found in the market by using techniques related to web scraping, NLP, and product comparison. The project is based on Indian e-commerce websites, and they are pretty challenging because of their complex structure and security. Also, the application is being developed in which users can be able to give search keywords, and the tool will return links related to the searched product. This paper explains dropshipping, the relevance of web scraping in it, the methodology of the Dropship Finder, its workflow, advantages, limitations, and future scope. Keywords—Drop Shipping; Web Scraping; BeautifulSoup

Keywords: Drop Shipping, Web Scraping, BeautifulSoup

# EARLY LUNG CANCER DETECTION USING AI

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Abstract: Abstract Lung cancer is one of the leading causes of cancer-related deaths worldwide, primarily due to late-stage diagnosis and limited early detection methods. This project aims to develop an automated system for early lung cancer detection using Convolutional Neural Networks (CNNs), a powerful deep learning technique for image analysis. The system utilizes chest CT scan images to train and validate the model, enabling accurate classification between cancerous and non-cancerous tissues. The architecture of the CNN is designed to efficiently extract critical features from the images through multiple convolutional and pooling layers, followed by fully connected layers for classification. Preprocessing techniques such as normalization and augmentation are employed to enhance model performance. Evaluation metrics including accuracy, precision, recall, and F1-score are used to assess the model's effectiveness. The proposed approach demonstrates promising results, providing a foundation for potential clinical application to support radiologists in early and accurate lung cancer diagnosis.

Keywords: Lung cancer detection, Convolutional Neural Networks (CNNs), Chest CT scan, Image analysis, Early diagnosis system

# EARLY PARKINSON'S DISEASE DETECTION USING MACHINE LEARNING

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Abstract: Parkinson's Disease (PD) is a progressive neurodegenerative condition that impacts millions of individuals globally, manifesting through symptoms such as tremors, muscle stiffness, slowed movement, and difficulties in speech. The existing diagnostic techniques primarily depend on clinical assessments, which can be subjective and may result in delayed diagnosis. This research introduces an artificial intelligence-based methodology for the detection of Parkinson's by utilizing vocal biomarkers and evaluating various Machine Learning (ML) and Deep Learning (DL) models. Utilizing a publicly accessible dataset, we implement Support Vector Machine (SVM), Random Forest (RF), and Long Short-Term Memory (LSTM) networks for classification tasks. We apply feature extraction methods to critical speech characteristics, including jitter, shimmer, and harmonic-to-noise ratio, to improve predictive accuracy. A comprehensive assessment of the models is performed, focusing on metrics such as accuracy, precision, recall, F1-score, and ROC-AUC. The findings reveal that LSTM surpasses conventional ML models, exhibiting enhanced classification performance for the early detection of Parkinson's. This study highlights the transformative potential of AI in advancing neurological diagnostics and sets the stage for real-time, non-invasive, and scalable screening methods.

Keywords: Parkinson's Disease detection, Vocal biomarkers, Machine learning, Deep learning, LSTM networks

# EDUCATION INTERFACE USING WEB DEVELOPMENT

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Abstract: "Learning Interface Using Web Development": --- Abstract In the digital era, the design and functionality of learning interfaces play a pivotal role in enhancing educational experiences. Web development offers powerful tools and technologies to create dynamic, responsive, and user-centric learning environments. This study explores the integration of web development in building interactive learning interfaces, focusing on the use of HTML, CSS, JavaScript, and modern frameworks such as React and Vue.js. By leveraging these technologies, developers can design platforms that facilitate intuitive navigation, real-time feedback, multimedia content delivery, and adaptive learning pathways. The abstract highlights the importance of user interface (UI) and user experience (UX) principles in promoting learner engagement, accessibility, and retention. Furthermore, it discusses the challenges in developing scalable and inclusive web-based learning interfaces and proposes best practices for effective implementation. The findings suggest that a well-designed web interface not only supports diverse learning styles but also fosters an engaging and efficient learning process in both formal and informal educational settings. --- Let me know if you'd like it tailored for a specific paper, project, or educational level.

Keywords: Web development, interactive learning interfaces, HTML, CSS, JavaScript, user interface (UI) design.

# E-MAIL SPAM DETECTION USING GNN

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Abstract: Email spam detection is an essential component of secure digital communication, aiming to filter out unsolicited and potentially harmful messages. This project proposes an advanced spam detection approach using Graph Neural Networks (GNNs), specifically a Graph Convolutional Network (GCN), to capture hidden relationships between emails. The SpamAssassin Public Corpus was used for experimentation, containing a diverse set of spam and ham emails. Initial preprocessing involved cleaning text, removing metadata, tokenization, stemming, and transforming the text using TF-IDF vectorization. Cosine similarity was then computed between emails to create a graph where each email is represented as a node, and edges indicate their semantic similarity. The resulting graph was converted into PyTorch Geometric format for training the GCN model. The model was trained and evaluated using accuracy, precision, recall, and F1-score. Results showed that the GCN model effectively captured contextual patterns and outperformed traditional models. The project sets the groundwork for real-time, intelligent spam detection systems and highlights the potential of graph-based deep learning in cybersecurity applications.

Keywords: Email spam detection, Graph Neural Networks (GNNs), Graph Convolutional Network (GCN), SpamAssassin Public Corpus, TF-IDF vectorization, Cosine similarity, PyTorch Geometric

# END-TO-END AI-ENHANCED PITCH PERFECTING WITH DEEP LEARNING COACHING: A COMPARATIVE APPROACH

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Abstract: Public speaking and the capacity to deliver compelling pitches are vital skills across multiple fields, including business, academia, and professional communication. Traditional coaching methods often depend on human mentors, which can be costly, inconsistent, and challenging to implement on a larger scale. This paper introduces an innovative AI-driven pitch coaching system designed to evaluate speech quality, provide feedback through advanced deep learning algorithms, and improve pitch delivery via an interactive AI assistant modeled after the oratory techniques of Steve Jobs. The system employs Google Gemini AI for comprehensive speech analysis, ElevenLabs AI for real-time vocal coaching, and advanced deep learning methodologies to refine textual content. By assessing key elements such as speech fluency, modulation, clarity, and audience engagement, the model delivers timestamped feedback that empowers users to enhance their public speaking abilities. Experimental results demonstrate that AI-assisted coaching results in notable enhancements in speech clarity by 18%, vocal modulation by 21%, and overall audience engagement by 25% when compared to traditional self-practice techniques. The proposed system presents a scalable, efficient, and interactive alternative to conventional human coaching, marking the beginning of a new era in AI-enhanced public speaking training.

Keywords: Public speaking, AI-driven pitch coaching, Speech quality evaluation, Deep learning, Vocal coaching.

# ENERGY MANAGEMENT SYSTEM THROUGH BEHAVIORAL ANALYSIS

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Abstract: The increasing demand for the electricity worldwide places that immense pressure on non-renewable energy sources, such as coal, oil, and natural gas. These resources are finite and contribute significantly to environmental pollution and climate change. As a result, efficient energy management has become a pressing concern for governments, utility companies, and consumers alike. Accurately predicting electricity consumption is crucial for optimizing energy usage, minimizing wastage, and transitioning to greener energy solutions. This paper presents a model for predicting electricity consumption using Gradient Boosting Regressor (GBR), a machine learning algorithm known for its high predictive accuracy. By analyzing historical data, weather patterns, and appliance usage, this model provides a method for forecasting future electricity demand. The results show that the GBR model can optimize resource distribution and support the integration of renewable energy sources into the grid. The model's implications for reducing reliance on nonrenewable resources and improving sustainability are discussed.

Keywords: Electricity consumption prediction, Gradient Boosting Regressor, Machine learning, Energy management, Renewable energy integration

# ENHANCING DOCUMENT INTEGRITY WITH BLOCKCHAIN AND IPFS-BASED VALIDATION SYSTEMS

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Abstract: Blockchain technology has emerged as a potential solution to combat document fraud and misuse in various domains, including government, education, and finance. The current document verification process is tedious, long, and prone to falsification, jeopardizing the credibility of both the document holder and the issuing authority. This research proposes a private permissioned blockchain network to develop a decentralized system for sharing authenticated government documents, educational certificates, and other official records between government bodies, organizations, and academic institutions. The blockchain-based framework ensures security, reliability, transparency, and immutability, making it resilient to modifications and forgery. The system utilizes cryptography to link blocks, creating an open distributed ledger that records all transactions, and enables real-time verification and authentication of documents. The proposed system addresses the issue of electronic document forgery, providing a secure means for storing and sharing documents and notifying users of any changes or adjustments made to the documents. By leveraging blockchain technology, the efficiency and security of the document verification and issuing process are drastically improved, ensuring the integrity of both the document holder and the issuing authority .

Keywords: Blockchain, Document Verification, Cryptography, Decentralized System, Data Integrity

# ENHANCING DOCUMENT RETRIEVAL USING AI AND GRAPH-BASED RAG TECHNIQUES

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Abstract: Retrieval-Augmented Generation (RAG) has emerged as a potent method for enhancing the capabilities of large language models (LLMs) by integrating them with external knowledge sources. While traditional RAG models rely heavily on textual similarity for retrieval, often leading to issues like context drift and hallucinations, graph-based RAG offers a more sophisticated approach. By representing documents and their relationships within a graph structure, graph-based RAG enables more context-aware retrieval, reducing hallucinations, and facilitating multi-hop reasoning. This abstract provides an overview of the RAG landscape, contrasting traditional and graph-based approaches, and highlights the advantages of graph-based RAG in addressing the limitations of traditional methods. The application of graph-based RAG to various domains, such as question answering, dialogue systems, and recommendation systems, is also explored. The abstract concludes by emphasizing the potential of graph-based RAG to revolutionize information access and retrieval in diverse AI applications. Graph-based RAG has the potential to revolutionize how information is accessed, retrieved, and utilized across diverse AI applications.

Keywords: Graph-Based RAG, Knowledge Retrieval, Large Language Models, Multi-hop Reasoning, Context-Aware Systems

# ENHANCING VIRTUAL YOGA TRAINING: REAL-TIME POSE ASSESSMENT WITH VOICE- GUIDED ACCURACY FEEDBACK

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Abstract: This project introduces an AI-based virtual yoga trainer that provides real-time voice feedback to enhance asana accuracy, offering a transformative approach to autonomous yoga practice. By leveraging computer vision and machine learning, our solution analyzes body posture with high precision, delivering immediate, personalized corrections without the need for a physical instructor. Unlike traditional methods that rely on human observation, our system surpasses human evaluation by detecting subtle misalignments and offering targeted guidance to improve pose accuracy. The integration of real-time audio feedback not only enhances user engagement but also makes virtual yoga training more accessible and adaptable to individual needs. This innovation addresses a crucial gap in virtual fitness solutions by ensuring interactive, dynamic, and data-driven coaching for practitioners at all levels. The findings of this study demonstrate the potential of AI in revolutionizing yoga instruction, paving the way for more intelligent, efficient, and personalized virtual training experiences.

Keywords: AI in Fitness, Virtual Yoga Trainer, Computer Vision, Real-Time Feedback, Pose Estimation

# EXPENSE TRACKER AND FAIR SPLIT WITH AI INTEGRATION

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Abstract: Managing personal and shared expenses has always been a critical yet cumbersome task, especially in group activities where fairness is essential. This paper explores the development of an AI-powered expense tracking and fair splitting system that automates the categorization of expenses and ensures fairness in splitting costs. By integrating machine learning models and dynamic algorithms, the system provides an equitable, transparent, and personalized solution for expense management. AI-powered categorization reduces the need for manual input, while dynamic fair splitting considers multiple factors such as individual consumption, financial capacity, and personal preferences. The system design, workflow, and key architectural components are outlined, demonstrating how AI can enhance usability, fairness, and efficiency in shared financial scenarios. This paper also discusses the challenges faced during development, the implementation of AI models, and the user feedback loop to continuously improve accuracy and fairness.

Keywords: Expense Tracking, Fair Cost Splitting, AI in Finance, Machine Learning, Personal Finance Automation

# EXPENSE TRACKING SYSTEM USING MACHINE LEARNING

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Abstract: Effective financial management is essential for individuals and businesses seeking financial stability and success. This project focuses on creating a powerful spending tracking and budgeting program that uses machine learning and advanced analytics. The system is intended to ease money management by giving users tools to monitor, evaluate, and optimize their spending in real time. The software has a user-friendly graphical interface written using Python and Tkinter, making it accessible to users of varied technical skill levels. SQLite is used to power the database layer because it is lightweight, dependable, and allows for local storage, making it perfect for securely keeping financial data. The software leverages scikit-learn to build predictive models that analyse spending habits, forecast expenses, and identify savings opportunities, empowering users to make informed financial decisions. The Python-based backend logic ensures that the user interface, database, and machine learning modules all work together seamlessly. Matplotlib and Seaborn increase financial reporting by providing intuitive graphs and charts for tracking spending patterns, budget targets, and category-specific expenses.

Keywords: Spending Tracking, Budgeting, Machine Learning, SQLite, Data Visualization.

# EXPLAINABLE AI FOR RECOMMENDER SYSTEM IN DEMAND FORECASTING

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Abstract: The dimension of data currently dominates one's consideration as to whether a business succeeds or sinks: customer engagement or demand forecasting or personalized recommendations. A unified AI framework for supervision is the subject of this research; customer segmentation, demand forecasting, collaborative-filtering-based recommendations, and explainability techniques are integrated to enhance operational decision-making in retail. The hierarchical model uses K-Means clustering for customer segmentation, ARIMA for time- series demand forecasting, and collaborative filtering through Singular Value Decomposition (SVD) for personalized recommendations. For level attentiveness and interpretability of recommendations through AI, SHapley Additive exPlanations (SHAP) are being employed. System-generated actionable insights relatable to retail are provided via interactive visual analytics in the form of scatter plots, heat maps, bar charts, and feature importance plots. In experiments, the efficiency of the propose model was testified through recommendations accuracy improvement, inventory management enhancement, and customer satisfaction rise. Explainability fosters trust in AI-driven decisions, guarantees fairness, and mitigates bias in recommendations. Results promise new opportunities for the promotion of AI in retail, thus laying the groundwork for personalized marketing and wise resource planning and retaining customers on a strategic level.

Keywords: Customer Segmentation, Demand Forecasting, Collaborative Filtering, Explainable AI, Retail Analytics

# EXPLORING QUANTUM MACHINE LEARNING FOR IMAGE RECOGNITION

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Abstract: This research explores quantum machine learning for image classification, comparing classical and quantum models. A classical convolutional neural network (CNN), based on the LeNet architecture, achieved 99.12% accuracy on MNIST, outperforming a quantum CNN, which attained 93.30%. Quantum encoders applied to Fashion-MNIST reached 85.60%, while quantum support vector machine (SVM), implemented for binary classification, obtained 71.34%. The study integrates hybrid quantum-classical models, leveraging quantum circuits for feature extraction. A quantum autoencoder-based classifier was introduced, demonstrating efficient data compression and classification without additional qubits. Feature encoding using RX gates mapped classical data into quantum states, and the impact of parameterized quantum circuit structures on classification accuracy was analyzed. Results indicate that specific ansatz structures yield superior accuracy, highlighting the significance of quantum circuit design. While classical models currently outperform quantum counterparts, quantum approaches reduce trainable parameters and computational complexity. Limitations in current quantum hardware, including noise and scalability, restrict performance. However, advancements in error mitigation, quantum gate efficiency, and scalable quantum architecture could bridge the gap with classical methods. These quantum techniques hold potential in aerospace applications, such as satellite image classification, anomaly detection in remote sensing, and real-time processing of high-dimensional image data. This study underscores the growing role of quantum circuits in machine learning, particularly in feature extraction and classification, suggesting that future quantum hardware could unlock new capabilities in end-to-end learning beyond hybrid approaches.

Keywords: Quantum Machine Learning, Image Classification, Quantum CNN, Quantum Autoencoder, Hybrid Quantum-Classical Models.

# FACE AUTHENTICATION PAYMENT PLATFORM

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Abstract: As the world becomes more and more digital, online financial transactions have become vitally necessary to secure. Older methods of authentication like passwords and OTPs are becoming more susceptible to cyber-attacks. To solve these problems, this project offers the creation of a Facial Authentication Payment Platform integrated into an e-commerce website for electronics shopping on a Django framework. The platform utilizes sophisticated facial recognition technology, leveraging Python, OpenCV, and deep learning models to authenticate users throughout the payment process. Subsequent to successful facial verification, Stripe is utilized to securely process transactions, offering a seamless and secure experience for users. The platform also includes liveness detection to thwart spoofing attacks, adding a further layer of security. In a 16-week development cycle, the project passed through system design, model training, integration, testing, and deployment phases. Thorough testing proved high accuracy, low latency, and high user satisfaction. The platform features an innovative, contactless, and secure online payment method, which mirrors the future direction of biometric authentication in e-commerce, banking, and other industries requiring high security and convenience for users.

Keywords: Facial Recognition, Biometric Authentication, E-commerce Security, Liveness Detection, Django Framework

# FACIAL IMAGE UPSCALING USING GANS AND SDAES

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Abstract: Abstract The enhancement of low-resolution facial images is a critical task in fields such as surveillance, digital forensics, and image restoration. This project presents a comparative analysis of two deep learning techniques—Stacked Denoising Autoencoders (SDAEs) and Generative Adversarial Networks (GANs)—for facial image upscaling. SDAEs are evaluated for their capability to reconstruct clean, high-resolution images by learning robust feature representations through unsupervised denoising. In contrast, GANs are assessed for their ability to generate photo-realistic high-resolution images using adversarial training. The study involves implementing both models, training them on standard face datasets, and evaluating their performance using metrics such as PSNR, SSIM, and perceptual quality. The objective is to identify the strengths and limitations of each method in terms of accuracy, detail preservation, and computational efficiency. This comparative approach provides insights into the suitability of each model for practical applications in facial image enhancement.

Keywords: Facial Image Enhancement, Super-Resolution, Stacked Denoising Autoencoders (SDAEs), Generative Adversarial Networks (GANs), Image Quality Metrics

# FAKE NEWS DETECTION USING XAI

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Abstract: Fake news has become widespread problem globally, where sensational news is shared without fact-checking or confirmation which leads to false rumours. People are fed misinformation online, such as on social media platforms and unreliable websites providing news headlines. Machine Learning techniques like Support Vector Machines (SVM), XGBoost, and Random Forest are used to identify fake news but lacks explanations and transparency. This study focuses on identifying false news from real ones and provides an explanation for its prediction using SHAP (SHapley-Additive-explanations). SHAP plots are generated to understand the reasoning behind the models' decision making.   This research also highlights the importance of integrating machine learning algorithms with eXplainable AI which helps it make more transparent, interpretable, and understandable to users. Even though there are some limitations of this study, it provides various findings that help in fake news detection and also serves as a basis for future research work aimed at improving the identification of false news using more enhanced technologies

Keywords: Fake News Detection, SHAP, Explainable AI, Machine Learning, Model Transparency

# FOCUS DETECTION USING EEGS

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Abstract: Electroencephalography (EEG) is a widely-used, non-invasive technique for recording the brain's electrical activity, offering critical insights into cognitive states such as focus and attention. This project explores the use of EEG brainwave patterns — specifically the delta, theta, alpha, beta, and gamma bands — to classify an individual's focus level during various cognitive tasks. Data was collected in both high- and low-attention scenarios, followed by extensive preprocessing to eliminate noise and artifacts. Advanced feature extraction techniques were applied to isolate meaningful brainwave characteristics, which were then fed into machine learning models such as SVM, Random Forest, CNN, and LSTM networks. The best-performing models achieved classification accuracies ranging from 75% to 90%, depending on task complexity and participant variability. The findings demonstrate a strong correlation between increased beta/gamma wave activity and heightened focus, while elevated theta/alpha activity often indicated relaxed or distracted states. The implications of this research are far-reaching, with potential applications in personalized education systems, workplace productivity monitoring, brain-computer interfaces (BCIs), and therapeutic interventions for attention-related disorders. Future directions involve enhancing real-time performance, improving model generalization, and integrating EEG-based attention tracking into accessible, wearable technology platforms

Keywords: EEG, Focus Classification, Brainwave Patterns, Machine Learning, Attention Tracking

# FUSION OF DEEP LEARNING AND MULTI VIEW GEOMETRY FOR ROBUST OBJECT DETECTION IN DISTRIBUTED CAMERA

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Abstract: Object detection is a cornerstone of modern technologies, playing a pivotal role in applications such as autonomous driving, robotics, industrial automation, and the development of smart environments. The demand for robust and accurate detection systems has never been more critical, as even minor inaccuracies can lead to significant challenges, particularly in safety-critical domains like automated driving where human lives are at stake. Addressing these challenges, this study introduces a novel approach that integrates multi-view geometry with deep learning techniques to develop a system capable of achieving superior object detection accuracy and reliability. The proposed system is built around a custom-trained YOLOv5 model, meticulously designed to enhance performance and achieve dimension estimation with an impressive margin of error within 2%. By utilizing multiple camera inputs, the system demonstrates substantial improvements over traditional single-camera setups in both detection robustness and spatial accuracy. The advantages of this multi-camera, geometry-aware approach are clear, offering greater precision and consistency across diverse scenarios. This breakthrough has the potential to revolutionize multiple industries, enabling safer autonomous systems, more reliable security solutions, efficient industrial manufacturing processes, advanced robotics capabilities, and the creation of intelligent, adaptive environments.

Keywords: Object Detection, Multi-view Geometry, YOLOv5, Deep Learning, Autonomous Systems

# GENERATIVE ART USING GANS

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Abstract: Generative Art Using GANs revolutionizes the realm of AI-driven creativity by blending technology with artistic expression. This project explores the capabilities of Generative Adversarial Networks (GANs) for image synthesis and Meta Llama for poetry generation, producing high-quality, context-aware artistic content. The minor project phase involved developing the base models, while the major phase focused on optimization for improved accuracy, efficiency, and real-time response, leveraging CPU acceleration to reduce training overhead. The project culminated in the creation of a web-based application, GenArtVerse, built with React.js and FastAPI for a seamless frontend-backend integration. To enhance accessibility and user experience, a speech recognition module enables voice-based content generation, while a JavaScript-powered chatbot guides users throughout the creative process. This system not only demonstrates the potential of AI in generating poetry and visual art but also addresses challenges such as poetic coherence and image fidelity. With applications in digital media, creative writing, and AI-assisted design, the project bridges the gap between machine learning research and practical deployment, offering a unique platform for interactive, AI-driven artistic exploration.

Keywords: Generative Art, GANs, Meta Llama, Poetry Generation, AI-Driven Creativity

# GENERATIVE MODEL TO ENHANCE IMAGE QUALITY OF MICROSCOPY DATA

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Abstract: Microscopy data is fundamental in scientific research; however, it has persistent issues concerning resolution, noise, and blurriness that hinder accurate observations. The traditional approaches have primarily focused on improving imaging devices and employing post-processing techniques, which are often expensive, time-consuming, and highly computationally intensive. A range of recent advancements in AI, especially the Generative Adversarial Networks (GANs) and Variational Autoencoders (VAEs), pose great potential for addressing these challenges. These models effectively augment superior imagery and consequently aid in improving resolution, reducing noise, and enhancing intricate details within the data range. They have the potential to significantly enhance microscopy technologies since they allow for real-time data improvement and reduce dependency on extensive post-processing efforts. Therefore, these models make the improvement of imagery far more cost-efficient and accessible, making high-quality microscopy images easier and faster to obtain for a wide range of research and industrial applications.

Keywords: Microscopy Data, Generative Adversarial Networks, Variational Autoencoders, Image Enhancement, AI in Microscopy

# GRID VISION – CRAFTING TOMORROWS ELECTRIC NETWORKS

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Abstract: This project presents an AI-driven framework for the intelligent mapping and optimization of electric grids using 2D infrastructure layouts. It automates the process of electric component placement and routing by integrating computer vision techniques and clustering algorithms. Satellite images or blueprint maps are preprocessed to identify regions of electrical demand. Each region is assigned synthetic load values based on visual and positional features. The system applies K-Means clustering to determine the placement of transformers and uses KDTree for identifying the nearest poles for efficient connectivity. Transmission lines are mapped using shortest-path routing via Dijkstra's algorithm. This approach reduces manual planning efforts, minimizes energy losses, and enhances scalability. Future improvements include integration of a UI dashboard, support for real-world data feeds, and advanced routing algorithms.

Keywords: Electric Grid, Computer Vision, Clustering Algorithms, Optimization, Load Mapping

# HAND GESTURE RECOGNITION FOR HUMAN-COMPUTER INTERACTION: A SURVEY AND ANALYSIS

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Abstract: Hand gesture recognition is one of the most critical technologies that support human-computer interaction. This capability allows machines to interpret hand gestures and enhance human-computer communication, providing a more intuitive and seamless user experience. Beyond such forms of interaction, this ability broadens the scope of interactive systems in various fields, including gaming, virtual reality, robotics, smart home automation, and healthcare. Hand gesture recognition plays a crucial role in assistive technologies, enabling accessibility for individuals with disabilities and improving human-machine collaboration. A complete hand gesture recognition system involves multiple components, such as data acquisition, feature extraction, and classification algorithms, all of which are widely described in this paper. We discuss underlying technologies, machine learning techniques, and real-world applications while identifying key challenges such as variations in lighting conditions, hand occlusion, and computational efficiency. A significant contribution of this paper is the implementation of hybrid models combining deep learning and classical machine learning techniques, demonstrating improved accuracy and real-time performance. These findings are essential in developing more efficient, precise, and user-friendly HCI systems that cater to diverse applications and enhance user experience.

Keywords: Hand Gesture Recognition (HGR), Human-Computer Interaction (HCI), Classification algorithms, Real-time environments, Deep learning.

# HAND GESTURES TO CARTOONS: DEVELOPING AN OPENCV FRAMEWORK FOR CREATING ANIMATED ART

Khushi Gupta, Tanishtha Chauhan, Sidharth Pradhan, Atul Sangal,Krati Rastogi Gupta

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Abstract: To make a new pipeline for real-time hand gesture-based cartoonification possible, this research provides an allinclusive system that integrates OpenCV, deep learning architectures, and OpenAI APIs. The four main components of the suggested system architecture are air gesture recognition for virtual writing, handwriting-to-digital-text conversion using a CNN, text-to-image generation using OpenAI APIs for cartoonification, and deployment on an interactive web interface. Using hand motions, the air canvas module gives means to write text in midair. High-performance CNN models process and translate it into digital format with very high accuracy. With an application of cutting-edge generative AI frameworks, the digital text becomes a prompt for generating cartoonized pictures. These technologies deal with the restrictions and limitations that exist with an area of direct picture drawing, such as ambiguity, inefficiency, and decreased precision. This is because the system contributes significantly to computer vision, human-computer interaction, and creating original content through its smooth, user-friendly interface and real-time performance optimization

Keywords: Hand Gesture Recognition, Cartoonification, OpenCV, CNN-based Text Conversion, Generative AI

# HEALTHCARE MANAGEMENT SYSTEM INTEGRATED WITH RFID TAGS

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Abstract: Manual record-keeping in hospitals often results in frequent errors, inefficiencies, and substantial financial losses, ultimately affecting the quality of patient care. This study introduces an RFID-based Hospital Management System that integrates RFID tags, a mobile application, and a secure backend database to improve data accuracy, streamline hospital operations, and enhance overall efficiency. A machine learning model was employed to analyze pre- and post-RFID financial data, achieving an impressive $R^2$ score of 0.85, indicating strong predictive capability and reliability. The results demonstrated a significant reduction in financial losses, improved patient tracking, accurate and timely medication administration, and more effective resource utilization across departments. Although minor fluctuations in financial performance were observed after 2018, largely due to partial adoption of the technology and external economic factors, the overall trend highlights the substantial benefits of RFID integration. This system offers a promising solution for modern hospitals aiming to reduce operational costs, increase patient safety, and optimize healthcare delivery.

Keywords: RFID-based Hospital Management, Patient Tracking, Machine Learning, Healthcare Efficiency, Financial Data Prediction

# HEART DISEASE PREDICTION USING MACHINE LEARNING

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Abstract: Since heart disease is a major global cause of death, early identification is essential for successful treatment. In this work, a dataset comprising clinical parameters such age, blood pressure, cholesterol levels, and ECG results is used to investigate the use of machine learning algorithms for heart disease prediction. The best prediction model was identified by evaluating three machine learning models: Random Forest, KNearest Neighbours (KNN), and Logistic Regression. Among the data pretreatment procedures were feature selection, exploratory data analysis, and handling missing values. To improve model performance, hyperparameter adjustment was implemented using RandomizedSearchCV and GridSearchCV. The results show that, after tweaking, Random Forest outperformed KNN (74.30%) and Logistic Regression (86.50%) in terms of accuracy, reaching the peak of 89.20 percent. Further validating model performance were evaluation criteria such confusion matrices, F1-score, precision, and recall.

Keywords: Heart Disease Prediction, Machine Learning Models, Random Forest, Feature Selection

# HYBRID PARALLEL CNN-LSTM MODEL WITH ATTENTION MECHANISM FOR ANOMALY DETECTION IN ECG TIME-SERIES DATA

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Abstract: Accurate detection and classification of cardiac arrhythmias are crucial for the early diagnosis and treatment of cardiovascular diseases (CVDs). While electrocardiogram (ECG) signals provide valuable insights into heart rhythms, manual interpretation is prone to errors and inefficiencies. This study proposes a hybrid deep learning model that combines Convolutional Neural Networks (CNNs) and Long Short-Term Memory (LSTM) networks with an attention mechanism to enhance ECG arrhythmia classification. Leveraging the MIT-BIH Arrhythmia Database, the methodology includes signal preprocessing, normalization, and segmentation. The model effectively captures spatial and temporal dependencies in ECG signals while prioritizing relevant features through the attention mechanism. Performance evaluation using metrics such as accuracy, precision, recall, F1-score, and ROC-AUC demonstrates a classification accuracy of 97%, significantly surpassing baseline CNN-only and LSTM-only models. Key contributions of this research include addressing challenges like class imbalance, enhancing model generalization, and improving interpretability through the attention mechanism. Future work aims to optimize model efficiency, integrate Transformer-based architectures, and enable real-time deployment in wearable healthcare devices and telemedicine applications.

Keywords: Cardiac Arrhythmia, ECG Classification, Hybrid Deep Learning, Attention Mechanism, MIT-BIH Arrhythmia Database

# IDENTIFICATION OF FALSE PRODUCTS AND COMPLAINT SYSTEM DEVELOPMENT USING BLOCKCHAIN TECHNOLOGY

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Abstract: The rise of counterfeit products in e-commerce poses significant risks to consumers and businesses. Blockchain technology, with its immutability and decentralization, offers a promising solution to address this issue. This research proposes a blockchain-based Ethereum system designed to enhance product authentication and facilitate a complaint management system. The system incorporates three primary stakeholders: Manufacturers, who register product details on an immutable ledger; Retailers, who track product authenticity and complaints; and Consumers, who verify product legitimacy using QR codes and raise complaints for counterfeit products. The proposed model ensures transparency and security in supply chain management, enhancing consumer trust and brand protection. The research outlines the architecture and functionalities of the system, emphasizing the integration of smart contracts for automated verification and complaint handling. Future developments include scalability enhancements and AI integration for counterfeit detection.

Keywords: Blockchain, Product Authentication, Ethereum, Smart Contracts

# IMAGE CAPTION GENERATION FOR LARGE DATASET USING LARGE LANGUAGE MODEL

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Abstract: The project "Image Caption Generation for Large Datasets Using LLM" aims to develop a system that generates coherent auditory descriptions of images. It consists of three stages: image classification, sentence generation, and text-to-speech conversion. First, a deep learning image classification model analyses and categorizes input images. Built on CNNs, this model is trained on a vast dataset to recognize objects, scenes, and activities with high accuracy. By leveraging deep learning, it captures intricate features and patterns essential for precise classification. Next, the classification results are fed into a large language model (LLM). The LLM, trained on diverse textual data, generates grammatically correct and contextually relevant image descriptions. This ensures meaningful and natural captions. Finally, a text-to-speech (TTS) generator converts the generated text into clear, natural-sounding speech. This provides accessible auditory transcripts, benefiting visually impaired users and enhancing multimedia experiences. This project integrates deep learning, NLP, and speech synthesis to improve accessibility, assistive technologies, and automated content generation, expanding user interaction with visual content across various domains.

Keywords: Image Captioning, Deep Learning, Large Language Models, Text-to-Speech, Accessibility

# IMAGE DEBLURRING USING GENERATIVE ADVERSARIAL NETWORKS

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Abstract: Blurred images degrade visual quality and affect numerous real-world applications, including surveillance, medical imaging, and autonomous systems. Traditional deblurring methods, such as Wiener filtering and motion deconvolution, often fail to recover fine details and struggle with complex motion blur. This research investigates the use of Generative Adversarial Networks (GANs) for image deblurring, leveraging deep learning to reconstruct high-quality, sharp images from blurred inputs. Our approach involves training a GAN-based model on a dataset of paired blurred and sharp images, optimizing it using adversarial loss and perceptual loss functions to enhance image fidelity. The model's performance is evaluated using Peak Signal-to-Noise Ratio (PSNR) and Structural Similarity Index (SSIM), demonstrating superior restoration capability compared to conventional techniques. Experimental results show that our model preserves fine details, generates realistic textures, and enhances overall image clarity. This research highlights the potential of GANs in addressing image deblurring challenges and provides a foundation for future advancements in real-time application.

Keywords: Image Deblurring, Generative Adversarial Networks, Deep Learning, Perceptual Loss, Image Restoration

# IMAGE DESCRIPTION GENERATOR

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Abstract: The increasing demand and rise of visual content on digital platform all across the world demands the need for automated image captioning systems that go well beyond the simple object recognition.This paper will present an insight to the automated image captioning system designed to generate accurate and correct descriptions. By leveraging a hybrid architecture of combining Convolutional Neural Networks (CNNs) for feature-extraction and Recurrent Neural Networks (RNNs) for caption generation, the model aims to produce rich, consize accurate depiction of the image. Utilizing the Flickr datasets and also incorporated the BLIP-processor, which includes thousands of images with corresponding captions, we rigorously train and validate the model through comprehensive testing phases, several changes were made to enhance the model accuracy. This paper highlights the architecture, methodologies, challenges faced and result of representing complex images, as well as addressing potential biases in the training data. Performance metrics such as BLEU are employed to evaluate the system's effectiveness. This work contributes to the advancement of image captioning technologies by aiming for accurate depiction of the scenarios.

Keywords: Automated Image Captioning, CNN, RNN, BLIP-Processor, BLEU Metrics

# IMAGE ENHANCEMENT USING PARTICLE SWARM OPTIMIZATION

Rishab Yadav, Priyanshu Bagasi, Kajal Singh,Rizak Singh, Sanjeev Kumar Tomar

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Abstract. Image enhancement has become essential in various fields to ensure visual clarity, such as medical imaging, satellite vision, and real-time observation. Most of the traditional techniques used for image enhancement are histogram equalization and filtering, which, however, are not adaptive and often introduce artifacts. This paper addresses the application of an adaptive image enhancement scheme using Particle Swarm Optimization (PSO) by comparing its performance with advanced deep learning techniques such as Convolutional Neural Networks (CNNs) and Generative Adversarial Networks (GANs). We present the hybrid PSO-CNN model, which will be largely trained with real-world datasets, such as low-light drone images for enhancement parameter optimization. Experiments carried out with PSNR and SSIM verify that PSO-based methods present better performance compared to conventional techniques, with the hybrid PSO-CNN model producing results that are as good as deep learning methods but costs much less computationally.

Keywords: Image Enhancement, Particle Swarm Optimization, PSNR, SSIM

# IMAGE FORGERY DETECTION USING MACHINE LEARNING

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Abstract: The integration of deep learning with quantum computing has shown significant promise in the field of digital image forensics. This study proposes a novel hybrid model that combines the VGG16 architecture with quantum computing principles to enhance image forgery detection. VGG16, known for its deep structure, effectively extracts intricate features from images, while quantum computing leverages superposition and entanglement to process data efficiently. The hybrid model demonstrated superior performance on the CASIA dataset, achieving a training accuracy of 94.98% and a validation accuracy of 88.97%. Key metrics such as precision (89.2%), recall (87.5%), and F1-score (88.3%) further validate its robustness and reliability. Despite computational challenges, the quantum-enhanced approach significantly improved classification accuracy, generalization, and scalability. Future research should focus on real quantum hardware implementation and diverse dataset integration to fully realize the potential of this hybrid model in real-world applications. Keywords: Image forgery detection, VGG16, Quantum computing, Hybrid model, Digital forensics.

Keywords: Image Forgery Detection, VGG16, Quantum Computing, Hybrid Model, Digital Forensics.

# IMAGE GENERATOR USING OPENAI, FLASK AND REPLIT

Mohak Bhatia, Arshdeep Singh Bhatia,Abhishek Singhal

Department of Computer Science Engineering, ASET, AUUP Noida

Abstract: In our project, we dwell into development of a web application which generates images based on a creative prompt (text input) from user and other various inputs like image resolution and DALL-E 2 or DALL-E 3 according to user's wishes and requirements. The images were generated based on user descriptions and inputs using OpenAI's DALL-E image generation model through an OpenAI API Key. We will be using Python Programming language, especially Flask which is an effective backend framework of the dynamic language. For UI and frontend, HTML and CSS were leveraged to provide the user with a smooth and seamless experience. Replit, an IDE will be used for the purpose of development and deployment. The results of the images generated from OpenAI's DALL-E 2 and DALL-E 3 will be further compared with images generated from models developed by other tech giants (Meta AI's Emu, Stability AI) using three metrics – Sharpness, Entropy and Inception Score. Results of DALL-E 2 and DALL-E 3 will also be combined to form a third image that will tell us how OpenAI stands in comparison and how they improved their model overtime, we will be using Neural Style Transfer for that, which tells us parameters used by OpenAI for improvement in their model. This study includes applications of Computer Vision and Deep Learning for metric comparison and Neural Style Transfer.

Keywords: Image Generation, DALL-E, Neural Style Transfer, Computer Vision, Deep Learning Models.

# INDIAN SIGH LANGUAGE DETECTION USING CNNS

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Abstract: In India, millions with hearing and speech impairments rely on Indian Sign Language (ISL) for communication. However, due to its unique syntax and regional variations, ISL has not seen the same technological advancements as sign languages like ASL or BSL. This study introduces an AI/ML-based system using Convolutional Neural Networks (CNNs) to recognize and interpret ISL gestures in real time, capturing both spatial and temporal dynamics for improved accuracy. A comprehensive dataset reflecting ISL's regional diversity ensures the system is inclusive and adaptable. The system aims to bridge communication gaps in sectors like education, healthcare, and public services, enhancing integration between the deaf and mute community and mainstream society. Scalable and cost-effective, it can be integrated into mobile apps, wearables, and public kiosks, contributing to a more inclusive society.

Keywords: Indian Sign Language, CNN, gesture recognition, real-time interpretation, inclusivity

# INTELLIGENT SYSTEM FOR AGRICULTURAL CROP PROTECTION

Keshav Yadav, Ashutosh Upadhyay,Seema Sharma

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Abstract: Absolutely. Here's a 200-word abstract tailored for a research paper on "Intelligent System for Agricultural Crop Protection," specifically focusing on your weed detection CNN: Abstract: This research presents an intelligent system for agricultural crop protection, leveraging deep learning to automate the detection and classification of common weed species. Specifically, a Convolutional Neural Network (CNN) is developed to identify horseweed, kochia, ragweed, and RRPW from image data. A dataset comprising images of these weeds, organized into training and testing sets was utilized. The CNN architecture was designed and trained to accurately classify weed species, addressing the challenge of manual weed identification, which is both time-consuming and prone to errors. The system incorporates data preprocessing techniques, including image resizing and normalization, to enhance model performance. Evaluation metrics, such as accuracy, precision, recall, F1-score, and a confusion matrix, were employed to assess the model's efficacy. Results demonstrate the potential of deep learning in creating robust agricultural tools for precise weed management. This intelligent system aims to minimize herbicide usage by enabling targeted weed control, thereby promoting sustainable agricultural practices. The research highlights the significance of CNNs in crop protection and paves the way for further advancements in automated agricultural monitoring and management systems.

Keywords: Deep learning, Convolutional Neural Network (CNN), weed detection, agricultural crop protection, image classification.

# INTELLIGENT VIDEO SURVEILLANCE

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Abstract: Intelligent Video Surveillance (IVS) systems are transforming security and monitoring through the use of technologies such as computer vision, machine learning, and artificial intelligence. By analyzing video streams in real-time, IVS enables the automated detection of unusual activities, facial recognition, and object identification. This reduces reliance on human operators and facilitates quicker responses to events. This paper investigates the incorporation of IVS within contemporary security systems and assesses its efficacy across various sectors, including urban areas, retail settings, and public safety initiatives. The system employs algorithms like YOLO v9 to achieve precise, real-time object and anomaly detection, thereby improving threat identification and movement tracking. Challenges and problems related to accuracy, privacy considerations, and the ability to scale Intelligent Video Surveillance IVS systems are addressed, and recommendations for future advancements of technology are provided. An evaluation of the system highlights effective real-time object detection and tracking, demonstrating high responsiveness in live monitoring scenarios.

Keywords: Artificial intelligence, object detection, security monitoring, machine learning algorithms, deep learning, anomaly detection

# INVISIDRAW- AIR CANVAS

Sphurti Agrawal ; Mehil Talwar,Rajni Sehgal

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Abstract: The increasing demand for natural, simple, and hands-free user interfaces in various fields has led to the development of innovative solutions like gesture-based systems. In response, a realtime gesture recognition system for an Air Canvas application was created, utilizing computer vision technologies to enhance digital interaction. The system uses libraries such as OpenCV, MediaPipe, and NumPy to track hand movements. The application integrates several key features: Hand Detection and Tracking, Gesture Recognition, Brush Thickness Adjustment, and Predefined Shapes Implementation. These features combine to provide a smooth, hands-free drawing experience. The system is designed to improve digital art creation, education, and professional environments by eliminating the need for physical tools. Experimental results show that the system accurately recognizes gestures and performs smoothly in real time. The Air Canvas system has wide applications across various industries, including education, which enhances virtual learning environments; the creative industry, where it supports hands-free digital art; and healthcare, where it enables touch-free interaction with medical imaging systems, in manufacturing, robotics, AR/VR, gaming, and retail, offering innovative ways to interact with technology.

Keywords: Gesture Recognition, Air Canvas, OpenCV, MediaPipe, Hands-free Interaction.

# IOT BASED ASSISTIVE DEVICE FOR ELDERLY CARE

Aanshi R kumar , Raushan kumar, Betty Paulraj

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Abstract: The major objective of this research work is to understand the importance of elderly care with the help of Internet of Things. The significance of the usage of technology in the Healthcare and the elderly care is studied and implemented in this work. The primary objective of this study resulted with significant improvement and performance in the proposed methodology when compared with the state of the art techniques. The experiment is carried out aAbstract—The major objective of this research work is to understand the importance of elderly care with the help of Internet of Things. The significance of the usage of technology in the Healthcare and the elderly care is studied and implemented in this work. The primary objective of this study resulted with significant improvement and performance in the proposed methodology when compared with the state of the art techniques. The experiment is carried out as the proof of concept in the real time environment and the results are observeds the proof of concept in the real time environment and the results are observed

Keywords: Elderly care, Internet of Things (IoT), healthcare technology, real-time environment, proof of concept.

# IOT BASED STRESS DETECTION FOR COGNITIVE ASSISTANCE OF ELDERLY

Mitali Kanchan, Aditi Goyal, Sakshi Gupta, Vibha Nehra

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Abstract: Facial expressions are one of the key features of human beings that can be used to speculate emotional state at a particular moment. The current work employs Convolution Neural Network to develop a facial recognition model that categorizes a facial expression into some different emotion categories Afraid, Anger, Disgust, Happiness, Neutral, Sad, and Surprise. Capturing facial expressions over a certain period of time can give an idea of what extent the elderly is feeling pain and can enable nurse/family members to decide their feelings and provide necessary assistance. For identification, the elderly's photos are continuously taken with a smart camera and sent to the decision maker (laptop or desktop). Once the elderly are identified, he/she is monitored continuously for emotion recognition through facial expressions, and the detected emotions are stored. When an abnormal condition is detected, an alert message is sent to the caretaker/nurse. The system analyses visual cues, such as facial expressions and eye movements to detect signs of stress using computer vision and machine learning.

Keywords: Facial expression recognition, Convolutional Neural Network (CNN), emotion detection, elderly care, computer vision.

# LARGE LANGUAGE MODELS FOR MENTAL HEALTH COUNSELLING

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Abstract: Mental health disorders are becoming more common in today's world, with more awareness but frequently restricted access to expert help. The COVID-19 epidemic has added to the global mental health crisis, with many people experiencing isolation, stress, and anxiety. The present shortage of mental health practitioners, particularly in remote regions, has resulted in a gap in accessible and timely care. LLMs offer a scalable answer to this problem by giving instant, 24/7 support to those in need, potentially acting as a first step for persons who are reluctant or unwilling to seek professional aid. This project aims to explore the use of large language models (LLMs) for mental health counselling. With advancements in natural language processing (NLP), LLMs like GPT have shown remarkable ability to engage in meaningful, human-like conversations. The project investigates how these models can be leveraged to assist in mental health support by providing empathetic responses, delivering coping strategies, and facilitating initial mental health assessments. The primary goal is to determine whether LLMs can bridge the gap in mental health resources by offering immediate, scalable support to individuals seeking help. While LLMs may not replace professional counsellors, they have the potential to serve as preliminary tools for users who may be reluctant or unable to seek professional help immediately. The project shall also examine the ethical challenges posed by LLMs in this sensitive domain, such as the risk of misinformation, lack of emotional nuance, and privacy concerns. Ensuring the responsible use of these models in mental health applications is crucial. The limitations of LLMs, particularly in dealing with complex or severe mental health conditions, will also be a focus. By analyzing the strengths and weaknesses of LLMs for mental health counselling, this project aims to highlight the potential and boundaries of AI-driven mental health solutions in the digital age.

Keywords: Mental health counselling, large language models (LLMs), natural language processing (NLP), empathy in AI, ethical challenges.

# LEGAL ASSISTANT USING LLM AND RAG

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Abstract: The exponential growth of digital legal documentation has created a pressing need for efficient information retrieval and analysis tools. This project proposes the development of a Legal Assistant leveraging Large Language Models (LLMs) integrated with Retrieval-Augmented Generation (RAG) architecture to automate and optimize legal document search, summarization, and intelligent query answering. The system combines deepseek-r1 LLM capabilities with Ollama-based embedding generation and in-memory vector storage for high-speed, contextually accurate document retrieval. Legal documents are ingested, pre-processed through noise removal and chunking, embedded into semantic vector space, and stored for fast approximate nearest-neighbour search. Upon receiving a user query, the system retrieves relevant documents. Extensive evaluation demonstrates significant improvements in retrieval precision, response times, and legal research accuracy compared to traditional keyword-based methods. Furthermore, by incorporating agentic RAG techniques, the system autonomously handles document comparison, summarization, and analysis, providing a complete legal research support solution. The proposed Legal Assistant stands as a robust, scalable, and practical application of AI in the legal domain, setting a new benchmark for future AI-driven tools in law practices. Its deployment has the potential to significantly reduce research time, improve the reliability of legal advice, and enhance operational efficiency for legal professionals.

Keywords: Legal Assistant, Large Language Models (LLMs), Retrieval-Augmented Generation (RAG), legal document retrieval, AI in law.

# LEGAL DOCUMENT CLASSIFIER

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Abstract: This study explores the application of DeBERTa, a state-of-the-art transformer model, for multiclass text classification in the context of the Indian Judiciary. Using a comprehensive dataset of legal judgments, case summaries, and public petitions, the research addresses challenges such as handling long-sequence inputs, overlapping legal categories, and imbalanced data. Advanced preprocessing, hyperparameter tuning, and robust evaluation metrics are implemented to ensure optimal performance. The results demonstrate significant improvements in classification accuracy and generalizability, positioning DeBERTa as a valuable tool for automating legal document analysis and enhancing judicial processes.

Keywords: DeBERTa, text classification, Indian Judiciary, legal document analysis, multiclass classification.

# LEUKEMIA CANCER DETECTION USING IMAGE PREPROCESSING

Tanishq Tyagi, Ansh Verma, Udit Aggarwal, Supriya Raheja

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Abstract: This project presents an AI-driven system for leukemia detection using advanced image preprocessing techniques to enhance diagnostic accuracy. By integrating deep learning and medical imaging, the model effectively identifies leukemia while minimizing false positives. The system leverages refined preprocessing methods to improve image quality and optimize detection performance. Initial internal evaluations and external validation confirmed the model's reliability and generalizability across diverse datasets. Performance optimizations further enhanced processing speed and efficiency, ensuring practical deployment. Future work includes full-scale validation, broader testing, and potential clinical integration to support real-world applications in medical diagnostics.

Keywords: Leukemia detection, AI-driven system, deep learning, image preprocessing, medical diagnostics.

# LEVERAGING LONGFORMER FOR MULTI-PARAGRAPH QUESTION ANSWERING TASKS

Pranjal Gupta, Farhan Khan,Nidhi Mishra

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Abstract: Multi-paragraph question answering (QA) requires models to understand long-range dependencies and extract relevant information from large texts. Traditional transformers like BERT struggle with efficiency due to their quadratic self-attention mechanism, making them unsuitable for long-document processing. This study introduces a hybrid approach integrating Longformer, BM25, and contrastive learning to enhance QA performance. BM25 improves passage retrieval by ranking relevant segments, contrastive learning refines contextual representations for better answer extraction, and Longformer efficiently processes long texts using sparse attention. Evaluations on SQuAD 2.0 and HotpotQA demonstrate that this hybrid model outperforms traditional approaches in both accuracy and efficiency. An ablation study highlights the contributions of each component, showcasing improvements in relevance, robustness, and interpretability. By enabling more effective document-level comprehension and automated knowledge extraction, this research advances scalable QA systems, offering enhanced retrieval and reasoning capabilities for applications such as search engines, decision support, and AI-driven knowledge systems in various domains.

Keywords: Multi-paragraph question answering (QA), Longformer, BM25, contrastive learning, document-level comprehension.

# LOCATION AND COMMENT-VERIFIED DECRYPTION SYSTEM WITH STEGANOGRAPHY

Aditya Rana, Divyanshu Sharma, Venkata Sai Bhardwaj Murri, Tanishq Yadav, Nitish Kumar

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Abstract: This project presents a novel steganography-based secure communication system that combines advanced encryption, intelligent natural language processing, and automated media handling pipelines to enable hidden, location-aware message sharing through social media platforms. The primary objective was to build a full-stack solution that allows users to embed encrypted messages within images and distribute them publicly, with message decryption triggered only when certain contextual parameters—such as geographical coordinates, image metadata, or specific comments—are satisfied. This idea was developed with privacy, automation, and accessibility in mind, enabling secure communication without direct interaction between sender and receiver.The frontend of the application was designed using React.js and TailwindCSS to provide users with a clean, responsive interface where they can input social media URLs (e.g., DeviantArt, Reddit), upload custom images, and initiate the decoding or encoding workflow. Dynamic feedback, input validation, and real-time result displays were integrated to create an intuitive user experience. The backend, powered by Flask, handled core functionalities such as NLP processing, image scraping, comment parsing, encryption, and steganographic operations. It provided seamless integration with the front end via well-defined APIs, ensuring modularity and scalability. A key module of the system was the image downloader, designed to fetch PNG images from supported platforms while maintaining image integrity for steganographic decoding. Caching mechanisms were implemented to reduce bandwidth and improve performance. The project also included a powerful NLP-based comment scraper capable of parsing user comments from Reddit, YouTube, Instagram, and DeviantArt. This component plays a crucial role in identifying trigger patterns or extracting keywords embedded in social media comments that may be used for dynamic key reconstruction during decryption. To enhance the intelligence of the platform, a custom-trained NLP model was integrated to perform emotion detection, sentiment analysis, and keyword extraction from scraped comments. This enabled context-aware decoding where specific comment conditions—like emotional tone or keyword presence—could influence decryption. Models such as DistilBERT and lightweight neural networks were evaluated, and a balanced model was selected for its inference speed and accuracy on real-world social media data. The backend supports AES-GCM encryption to secure messages before hiding them inside images using Least Significant Bit (LSB) steganography. Only users with the correct combination of latitude, longitude, device ID, keyword, and session timing can reconstruct the key needed for decryption, adding an extra layer of dynamic authentication.This multi-component architecture demonstrates a unique intersection of steganography, NLP, and social media automation. The system was tested on real-world data and deployed with public-facing interfaces, proving its viability as a privacy-preserving communication tool. It sets the stage for future enhancements, such as multilingual comment support, real-time stream monitoring, customizable dashboards, and deeper conversational insight generation. Overall, the project showcases the potential of integrating cryptographic security with user-generated online content and intelligent automation to create a resilient, context-aware, and user-friendly platform for hidden communications.

Keywords: Steganography, Secure Communication, Natural Language Processing, Context-Aware Decryption, Location-Based Authentication.

# LUNG CANCER DETECTION AND CLASSIFICATION USING DEEP LEARNING

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Abstract: Abstract: Lung cancer remains a leading cause of mortality, necessitating advanced diagnostic techniques for early detection. Deep learning, particularly Convolutional Neural Networks (CNNs), has proven effective in medical imaging; however, specialized architectures are essential for capturing subtle lung cancer features. This study introduces a custom CNN model designed to enhance detection and classification accuracy. The proposed model integrates optimized layers and feature extraction techniques to improve diagnostic precision while mitigating overfitting. Experimental results demonstrate a high training accuracy of 98.53% and a validation accuracy of 93.07%. Despite these promising results, the model exhibits a validation loss of 74.5244, indicating the need for further refinement. This research contributes to the advancement of deep learning applications in medical diagnostics, providing a more reliable and efficient approach for lung cancer detection.

Keywords: Lung Cancer Detection, Convolutional Neural Networks, Medical Imaging, Deep Learning, Early Diagnosis.

# LUNG CANCER DETECTION USING DEEP LEARNING

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Abstract: Lung cancer continues to be one of the most common and fatal diseases on a global scale, making the development of automated detection techniques an essential goal. In this study, we propose an ensemble deep learning method based on novel CNN model (with CBAM layers), Enhanced Pre-Trained VGG16, and GoogLeNet architectures. Here, custom CNN retrieves deep spatial and contextual features, and then CBAM layers further refine those features—leveraging models for interdependent relationship learning between the differential features. We have modified VGG16 and GoogLeNet based on the integration of CBAM to refine feature extraction, and their fully connected layers are tailored for classification tasks. The ensemble model is used to aggregate predictions of all three architectures by using a weighted average approach which then was optimized through experimental validation of model contributions. The results reveal that ensemble model is much more reliable and accurate than standalone architecture in terms of classifying and robustness. This study shows that the attention-enhanced deep learning models have a good chance of improving lung cancer detection, thereby providing a more reliable and efficient diagnostic tool for medical applications.

Keywords: Lung Cancer Detection, Ensemble Deep Learning, CBAM Attention, CNN-VGG16-GoogLeNet, Medical Diagnostics

# LUNG CANCER DETECTION USING MACHINE LEARNING

Kapil Deshwal,Dolly Sharma

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Abstract: Lung cancer is one of the major killers due to cancer in the world. Therefore, there is a great need to invent and apply effective means of detection. With this thought process, this paper was developed with the concept of critically testing the performance of three known and applied machine learning techniques: Logistic Regression, Random Forest, and Support Vector Machine (SVM), especially for the purpose of lung cancer detection. We used an exhaustive dataset covering several clinical and diagnostic features relevant to lung cancer. Therefore, we were able to train each of the above models exhaustively, validate them, and evaluate and compare their respective accuracy, precision, recall, and F1-score metrics. Our results show that Logistic Regression had the greatest accuracy at 52%, followed by SVM at 50.3%, and then Random Forest at 47.5%. The study clearly shows a candidate's strength and weaknesses of each approach, since although Logistic Regression gives robust performance, one may require optimization and tuning of the other models. Advanced machine learning techniques as well as other data source integration to further increase the clinical applicability of such models of interpretability may open research avenues. The potential development of the comparative models may thus even further improve the earlier detection and diagnosis of lung cancer and further improve outcomes for patients compared with their current standards.

Keywords: Lung Cancer Detection, Machine Learning, Logistic Regression, SVM, Random Forest.

# MACHINE LEARNING BASED DISEASE PREDICTION MODEL

Ritika Bhardwaj, Ishika Sharma, Dhanishta Gupta, Saloni Sharma, Vikas Kamra

Department of Computer Science Engineering, ASET, AUUP Noida

Abstract: Pneumonia is a prominent source of illness and deaths globally, particularly in children and senior citizens. Traditional techniques of reading chest X-rays can be complex and susceptible to errors due to the subtle and overlapping signs of lung disorders, hindering accurate and timely diagnosis and treatment. Deep learning, a new advancement in AI, offers the potential to enhance diagnostic reliability and efficacy. This paper uses a convolutional neural network (CNN), a deep learning model, to identify pneumonia disease in chest X-rays. This paper reflects upon a framework, generating and assessing DL techniques for diagnosis of pneumonia, building on existing research in the field. Deep neural network topologies are evaluated for accuracy, sensitivity, specificity, and computational efficiency. The study found that deep learning models can outperform traditional diagnostic approaches, making them a valuable tool for healthcare providers. However, issues like model interpretability, data variability, and clinical integration are also addressed. Our findings highlight the potential for deep learning to improve pneumonia diagnosis, leading to more accurate, efficient, and accessible healthcare solutions.

Keywords: Pneumonia Detection, CNN, Diagnostic Accuracy.

# MALWARE DETECTION USING MACHINE LEARNING

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Abstract: - In today's time, as more people and businesses are using the internet, the number of cyber-attacks is also increasing. One of the biggest threats is malware, which is harmful software that can steal information, damage systems, or let hackers control devices. Old methods of detecting malware are slow and may not find new types of attacks. That is why faster and smarter solutions are needed.In this project, we built a system using Machine Learning (ML) to detect malware quickly and correctly. We worked on four types of malware: Phishing, Spyware, QHost, and LegMir. Phishing tricks users to give away information, Spyware collects personal data secretly, LegMir steals bank details, and QHost changes system settings to redirect users to bad websites.We collected data, cleaned it, and found important features that can help models learn better. We trained different ML models like Decision Trees, Random Forests, and SVM. After testing, we found that Random Forest gave the best results.Our system could detect Phishing and Spyware most accurately, while LegMir was a little harder. This project shows that Machine Learning can help make malware detection faster, more reliable, and safer for everyone online

Keywords: Malware Detection, Machine Learning, Random Forest, Cybersecurity, Phishing.

# MEDIA DEEPFAKE PROTECTION USING ARTIFICIAL INTELLIGENCE

Sahir Ahmed, Pratham Chauhan, Aryan Chauhan,Betty Paulraj

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Abstract: Abstract—The primary work done in this research is the identification of the Deep Fake content in the Social Media . The incorporation of Machine Learning and the advanced Deep Learning models have attained significant results in identifying the false content. The details of the observations done were also presented . The performance of the proposed system is compared with the methods in the literature. This paper introduces a deepfake detection system using convolutional neural networks (CNNs) for feature extraction and classification. The technique includes preprocessing input data, deep visual feature extraction, classifier layer definition, and performance optimization by verifying the loss function. The system is evaluated through extensive experiments, which provide high accuracy and reliability to identify synthetic media from authentic content.

Keywords: Deepfake Detection, CNN, Social Media, Deep Learning, Synthetic Media.

# MEDICAL IMAGE CLASSIFICATION FOR EARLY DISEASE DETECTION

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Abstract: Medical Image Classification for Early Disease Detection" leverages machine learning to improve early disease diagnosis through automated medical image classification. It focuses on detecting diseases like cancer, cardiovascular conditions, and neurological disorders by analyzing X-rays, MRI, CT scans, and histopathology slides. The methodology involves collecting and preprocessing a diverse dataset through normalization, standardization, and augmentation to enhance model robustness. Convolutional Neural Networks (CNNs) are implemented due to their effectiveness in image classification, with transfer learning applied to improve performance when data is limited. Hyperparameter tuning and model optimization further refine the system for better generalization to unseen data. Evaluation metrics, including accuracy, sensitivity, specificity, and area under the curve (AUC), measure model performance. The model aims to provide early detection, reduce diagnostic errors, and enhance healthcare efficiency by automating image analysis. This automation supports healthcare professionals, especially in resource-limited settings, by offering faster and more accurate diagnostics. This detection holds significant potential to revolutionize medical diagnostics through AI, improving patient outcomes and streamlining the diagnosis process across healthcare systems.

Keywords: Machine learning, CNN, deep learning, accuracy, diagnostics

# MEDICAL ONLINE MANUAL (MOM): A COMPREHENSIVE WEB APPLICATION FOR SYMPTOM ANALYSIS, HOME REMEDIES, AND HEALTHCARE RESOURCE MAPPING

Anushka Singh, Lavanya Thind, Smriti Sehgal

Department of Computer Science Engineering, ASET, AUUP Noida

Abstract: With the growing requirement for reliable and accessible healthcare information, there is an emerging use of AI-powered chatbots offering medical guidance to patients. Medical Online Manual is an AI-powered chatbot aiming to offer disease predictions based on symptoms, home remedies and over the-counter medicine recommendations, and nearby healthcare services. The chatbot utilizes machine learning methods, more specifically the Na¨ ıve Bayes classifier to analyze symptoms, OpenFDA API to obtain information about drugs, and a geolo cation API for live healthcare services. Performance evaluation metrics like accuracy, precision, recall, and F1-score has been calculated for the chatbot's efficiency. The output proves the chatbot's suitability in directing people to proper healthcare solutions, which in turn will decrease the load on medical staff. Nevertheless, limitations in natural language processing algorithms and dataset limitations make it important to improve it for better accuracy and usability. Keywords—symptom analysis, machine learning, geolocation services, healthcare automation, AI-driven chatbot.

Keywords: symptom analysis, machine learning, geolocation services, healthcare automation, AI-driven chatbot

# MEDICAL RECORDS MANAGEMENT SYSTEM USING BLOCKCHAIN

Atharva Tyagi, Simmi Ghosh,Shweta Bhardwaj

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Abstract: This project aims to develop a secure, decentralized medical records management system using blockchain technology. It ensures tamper-proof data integrity, patient-controlled access, and regulatory compliance (HIPAA & GDPR). Smart contracts, encryption algorithms, and IPFS are integrated to securely store and share medical records, providing a scalable and transparent solution for healthcare data management.

Keywords: Blockchain, Medical Records, Smart Contracts, IPFS, Data Security.

# MEDIMAGENET: ENHANCED DIAGNOSTIC IMAGING WITH AI

Vaishali Aggarwal, Ishika Thakur, Esha Dutt, Lakshay Tyagi, Sanjiv Kumar Tomar

Department of Computer Science Engineering, ASET, AUUP Noida

Abstract: Osteoporosis and osteopenia are common bone disorders that impair mobility, especially in older adults. Early detection is crucial but traditional methods like bone densitometry are costly. This research presents a deep learning model using the Efficient Channel Attention (ECA) mechanism to classify knee X-ray images into normal, osteopenia, and osteoporosis categories. Through data augmentation and adaptive learning, the model achieved higher accuracy and reliability compared to existing methods, offering an affordable and accessible solution for early diagnosis.

Keywords: Osteoporosis Detection, Deep Learning, Knee X-rays, Efficient Channel Attention (ECA), Medical Imaging Classification

# MELODY STREAM APP DEVELOPMENT

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Abstract: Melody Stream is an innovative music streaming application developed to provide users with instant access to a wide range of music across genres and languages. The app focuses on delivering high-quality audio, personalized recommendations, and a smooth user experience through an intuitive interface. Developed using a combination of React Native for cross- platform compatibility and cloud-based services for scalable storage and streaming, Melody Streamintegrates features such as real-time streaming, offline downloads, curated playlists, and social sharing. An AI-based recommendation engine enhances user engagement by analyzing listening behavior and suggesting tailored content. The development followed agile methodologies, ensuring iterative improvements based on user feedback and testing. Security and data privacy were prioritized, with encrypted user authentication and secure API integration. Designed for music lovers, Melody Stream combines technology and creativity to redefine how users discover and enjoy music on mobile devices

Keywords: Music Streaming, React Native, AI Recommendations, Data Privacy.

# MOTION DETECTION USING MIXTURE OF GAUSSIANS FOR WILDLIFE PHOTOGRAPHY

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Abstract: Motion detection in wildlife photography can be hindered by factors like lighting changes and background clutter, leading to false triggers. Using the Mixture of Gaussians (MoG) model can enhance detection by accurately modeling the background, allowing for better differentiation between static and moving objects. Wildlife photography often requires capturing animals without disrupting their natural behaviour. The MoG technique helps distinguish between moving objects and the background, allowing for precise detection of animal movement. This project utilizes a motion detection system based on the Mixture of Gaussians (MoG) algorithm to improve the effectiveness of wildlife photography. By automating the camera's trigger when motion is detected, the system minimizes human presence and increases the likelihood of capturing clear and timely images. The project focuses on real-time application, optimizing the system for both accuracy and responsiveness, offering photographers an efficient way to document wildlife without interference.

Keywords: Motion Detection, Mixture of Gaussians, Wildlife Photography, Background Subtraction, Real-time Application.

# MULTILINGUAL SENTIMENT ANALYSIS

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Abstract: In the digital age, understanding public sentiment across diverse linguistic landscapes is crucial. This paper presents a comparative analysis of sentiment classification models applied to three linguistically diverse languages: English, Hindi, and French. Leveraging pre-trained language models and a multilingual sentiment dataset, we evaluate performance metrics and highlight challenges and insights specific to each language. The research emphasizes fine-tuning mBERT to handle sentiment classification across English, Hindi, and French languages, including code-mixed inputs. We detail the processes of data selection, preprocessing, model fine-tuning, and evaluation. Our experiments demonstrate that a fine-tuned mBERT model can achieve high accuracy and F1-scores across multiple languages, highlighting its effectiveness in multilingual sentiment analysis tasks. Our results underscore the necessity of language-specific preprocessing and the advantages of multilingual transformer models in achieving robust sentiment classification across different languages.

Keywords: Sentiment Classification, mBERT, Multilingual Models, Code-mixed Inputs, Transformer Models.

# MULTIMEDIA DATA SECURITY IN CLOUD

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Abstract: The primary objective of this research work is to enhance the security of the cloud infrastructure as well as the data stored in the cloud environment. The enhanced DNA codec based encryption is proposed in the system to ensure the data security and the infrastructure is secured by adjusting the additional security features and there by enhancing the state of the art methods. The results obtained by the proposed methodology is observed to be computationally improved that the state of the art techniques.

Keywords: security, encryption, DNA codec, cloud service

# MULTIMODAL EMOTION RECOGNITION

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Abstract: The proposed project, "Advancing Multimodal Emotion Recognition: Integrating Text and Audio Modalities," aims to enhance the accuracy and comprehensiveness of emotion recognition systems by incorporating multiple data modalities. Building upon our prior work on text-based emotion recognition, this project introduces audio as a secondary modality for analysis. By leveraging advanced Natural Language Processing (NLP) techniques and audio feature extraction, the system seeks to identify nuanced emotional patterns from conversational data, addressing challenges like speaker overlap, varying tones, and background noise. The project spans 18 weeks, focusing on dataset preparation, model development, and evaluation to ensure robust performance. The outcomes include a research paper detailing findings and a functional multimodal emotion recognition model with real-world applications in mental health analysis, customer sentiment tracking, and conversational AI systems.

Keywords: Emotion Recognition, Multimodal, NLP, Audio Analysis, Sentiment Detection

# MULTIMODAL PAIN RECOGNITION: INTEGRATING FACIAL EXPRESSIONS AND BIOMEDICAL SIGNALS WITH DEEP LEARNING

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Abstract: Pain expression is characterized by high complexity and multidimensionality. It often uses subjective self-reporting as precise pain assessment remains an essential problem. In this research work, a new methodology for recognition of pain is represented based on a hybrid model that combines convolutional neural networks (CNNs) and particle swarm optimization (PSO) techique along with bidirectional long short-term memory (BiLSTM) networks. Considering the multidimensional and complex ways in which pain is expressed, this study used video and physiological signals as input data. The video part contains data where key features of facial expression are extracted, while physiological signals assess the physiological response. Experimental results significantly improved the binary pain classification accuracy over several existing models. This study is giving results of 86.3\% accuracy and proving the hybrid approach to be very effective. The CNN handles extraction of spatial hierarchies from video data, while the PSO-optimized BiLSTM appropriately models the temporal evolution of physiological responses. Through multimodal integration and advanced optimization approaches, a pathway is paved toward a more reliable and efficient pain recognition model which will eventually help in improving patient care.

Keywords: Pain Recognition, Hybrid Model, CNN, BiLSTM, Multimodal Integration.

# MULTI-SCALE DEEP FEATURE LEARNING FOR ROBUST CANCER BIOMARKER DETECTION IN HISTOPATHOLOGICAL DATA

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Abstract: Artificial intelligence (AI) has emerged as a transformative tool in oncology, offering powerful capabilities for automating the detection and classification of cancer. In this study, we aim to address the growing need for biomarker-driven, multi-modal cancer detection and classification using histopathological imaging. Our research focuses on developing a multi-scale deep learning framework that extracts and integrates discriminative features across various spatial levels to identify robust biomarkers associated with different cancer types. By combining convolutional neural networks (CNNs) with attention mechanisms, the proposed model effectively captures both micro-level cellular patterns and macro-level tissue structures, enhancing its diagnostic relevance. We further explore the integration of complementary modalities, such as clinical or genomic metadata, to enrich the model's predictive capabilities. Evaluations conducted on benchmark datasets, including BreakHis and TCGA, demonstrate significant improvements in accuracy, precision, and interpretability over traditional single-modality models. This work reinforces the potential of AI-powered, biomarker-centric approaches to advance precision oncology and support early, reliable cancer diagnosis in clinical settings.

Keywords: AI in Oncology, Multi-modal Cancer Detection, CNN, Biomarkers, Precision Oncology.

# MUSIC RECOMMENDATION SYSTEM USING MACHINE LEARNING

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Abstract: The increasing volume of digital music libraries has heightened the need for efficient and personalized music recommendation systems. This study presents a hybrid recommendation system that combines collaborative filtering using the Surprise library and content-based filtering leveraging song metadata. The system utilizes the Spotify Million Playlist Dataset, incorporating features such as tempo, energy, and danceability, alongside user interaction data to generate personalized recommendations. By employing machine learning techniques, the model effectively identifies user preferences and suggests music that aligns with individual tastes. Evaluation metrics, including accuracy and precision, demonstrate the system's efficiency in delivering relevant recommendations. This approach enhances user experience by streamlining music discovery, catering to both popular trends and unique preferences. Future enhancements include group playlist generation, file sharing capabilities, and improved visualization techniques to enrich user engagement.

Keywords: Music Recommendation, Hybrid Filtering, Collaborative Filtering, Content-Based Filtering

# NEARBY AUTONOMOUS VEHICLE INTERCONNECTED SYSTEM

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Abstract: The development of autonomous vehicles has seen significant progress over the past decade, with advancements in sensor technologies, vehicle-to-vehicle (V2V) communication, and real-time decision-making algorithms. This paper examines recent literature focused on key technologies enabling self-driving cars, particularly in the areas of V2V communication protocols, LoRa communication in V2V, and the training and testing of self-driving vehicles. The paper explores various technologies associated with these concepts, with a focus on understanding and reviewing their combined applications. Through this paper, functionalities that can be implemented for self-driving vehicles, particularly with LoRa radio communication have been identified. Furthermore, the integration of sensors like IMU, ultrasonic sensors, and cameras has been discussed, focusing on their roles in perception and decision-making in autonomous systems. Key challenges such as real-time processing, communication latency, and sensor limitations are identified, highlighting gaps in current research. Additionally, the paper addresses the scalability of these systems in diverse traffic environments and the legal and ethical considerations surrounding autonomous vehicle deployment. This paper concludes by outlining future research directions, particularly the need for improved sensor fusion algorithms and more robust V2V communication frameworks to enhance the safety and reliability of autonomous vehicles, along with the potential implementation of the proposed methodology involving the technologies and concepts discussed throughout.

Keywords: Autonomous Vehicles, V2V Communication, LoRa Communication, Sensor Fusion, Real-time Decision Making.

# NETWORK TRAFFIC ANOMALY DETECTION USING MACHINE LEARNING

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Abstract: With the ever-growing complexity of digital networks, detecting anomalies and cyber-attacks in real-time has become critical for maintaining secure communication systems. This project presents a machine learning-based approach to network anomaly detection by evaluating and implementing various algorithms on benchmark datasets. Initially, two widely used datasets—NSL-KDD and CICADA—were analyzed for their attack diversity, feature composition, and suitability for training intelligent models. Multiple machine learning techniques, including Naïve Bayes, Random Forest, QDA, AdaBoost, MLP, and ID3, were trained and compared. The ID3 decision tree algorithm was ultimately selected for its high performance and interpretability. The trained model was deployed via Flask and integrated into a user-friendly Streamlit web application. The interface features modules for dataset upload, attack detection, real-time monitoring, and report generation. A comparative analysis of algorithm performance metrics and an evaluation of the interface's usability were also conducted. This work demonstrates a practical and accessible solution for network anomaly detection and sets the foundation for future enhancements in model accuracy and system scalability.

Keywords: Network Anomaly Detection, Machine Learning, Real-time Monitoring, ID3 Algorithm, Cybersecurity.

# NEURAL STYLE TRANSFER WITH IMAGE CAPTIONING

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Abstract: This poster proposes an analysis of an integrated framework that combines Neural Style Transfer with Image Captioning models, facilitating the generation of aesthetically transformed images alongside coherent, contextually relevant descriptions. The proposed methodology makes use of Generative AI architectures, incorporating the Magenta model for style transfer while utilizing transformer-based language models for the automatic generation of captions. The framework enhances both visual feature extraction and semantic representation, enabling a robust fusion of artistic image manipulation and natural language generation. Empirical evaluation of datasets demonstrates significant improvements in content preservation, style fidelity, and caption quality through metrics such as Bilingual Evaluation Understudy (BLEU). This integration offers new potential for applications in creative AI, especially in domains requiring simultaneous visual and semantic synthesis.

Keywords: Neural Style Transfer, Image Captioning, Generative AI, Transformer Models, Creative AI.

# NON PARAMETER-DRIVEN DATA CLUSTERING

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Abstract: This paper explores and evaluates preprocessing techniques aimed at addressing the challenges of high-dimensional data in clustering applications. High-dimensional datasets often complicate clustering due to the increased complexity and potential loss of essential data structures. Therefore, the primary objective is to identify an efficient approach that effectively reduces dimensionality while preserving the intrinsic patterns and relationships within the data. The study focuses on three prominent techniques: Variational Autoencoders (VAEs), Principal Component Analysis (PCA), and First Neighbour Relations (FNR). Each technique is analyzed for its capability to maintain data integrity during dimensionality reduction, with performance evaluations conducted across diverse datasets to ensure reliability and generalizability. The comparative analysis emphasizes the potential of VAEs as a robust and adaptable solution, demonstrating superior performance in retaining essential data characteristics and enhancing clustering outcomes. These findings suggest that VAEs can be effectively integrated into clustering systems to improve accuracy, computational efficiency, and overall clustering performance.

Keywords: High-dimensional data, Clustering applications, Dimensionality reduction, Variational Autoencoders (VAEs), Principal Component Analysis (PCA), First Neighbour Relations (FNR)

# OBJECT DETECTION USING AI/ML

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Abstract: Helmet detection is essential to improving safety for motorcyclists and construction workers by ensuring compliance with safety regulations. This research presents an automated helmet detection system built upon deep learning techniques. The system employs a Convolutional Neural Network (CNN) to analyze images captured in real-time, determining whether individuals are wearing helmets. A diverse dataset of motorcyclist and construction site images was used, with data augmentation applied to improve robustness under varying lighting conditions and viewpoints. Experimental results reveal that the proposed system achieves high accuracy, with precision, recall, and F1-scores exceeding 90% on the test set. The real-time implementation demonstrates the system's potential for integration with traffic monitoring and law enforcement platforms. This paper discusses the methodology, experimental setup, and detailed performance analysis, highlighting the contributions, challenges, and future directions for automated helmet detection technologies in improving public safety.

Keywords: Object detection, Convolutional Neural Network, Helmet Detection, Safety

# ONLINE VOTING SYSTEM USING BLOCKCHAIN AND ML PREDICTIONS

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Abstract: Online voting holds the promise of increased accessibility and efficiency; however, ensuring the security and transparency of the process is paramount. In this project, we propose an Online Voting System utilizing Blockchain for immutable vote recording and Machine Learning (ML) for voter sentiment analysis. The blockchain ensures tamper-proof storage of votes, while ML techniques assess public sentiment on social media, offering predictive insights into potential voter behavior. Initial tests highlight the platform's robust security, scalability, and analytical strengths—signaling a step toward a more efficient and transparent electoral ecosystem.

Keywords: Online Voting, Blockchain, Machine Learning, Voter Sentiment, Electoral Security.

# OPTIMISING DRUG DEVELOPMENT WITH QUANTUM GENERATIVE ADVERSARIAL NETWORKS

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Abstract: Drug discovery for a given protein target is a complex, resource-intensive process, often requiring years of research and billions of dollars in investment. Computational techniques, particularly deep learning models, have accelerated molecular generation, but they remain constrained by classical computational limitations and reliance on known chemical patterns. To address these challenges, we propose a patch-based hybrid quantum conditional Wasserstein GAN with gradient penalty for drug design, integrating quantum computing to enhance exploration of the vast chemical space. This approach leverages both classical and quantum generative models to create novel molecular structures while ensuring they adhere to chemical and pharmacological properties. By conditioning the generative model on protein target sequences, we improve molecular specificity, increasing the likelihood of discovering viable drug candidates. The conditioning mechanism involves encoding protein sequences into reduced representations before incorporating them into the quantum circuit within the generator, allowing for more efficient and targeted molecular generation. Our method aims to bridge the gap between classical and quantum machine learning for drug discovery, leveraging quantum-enhanced sampling to navigate high-dimensional chemical spaces more effectively.

Keywords: Drug Discovery, Quantum Computing, Conditional GAN, Molecular Generation, Protein Target

# OPTIMIZATION TECHNIQUES IN LARGE LANGUAGE MODELS FOR NEWS REPORT GENERATION

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Abstract: Abstract The rapid advancement of Large Language Models (LLMs) has transformed news generation, yet challenges such as factual accuracy, coherence, and efficiency persist. This research explores optimization techniques to enhance LLMs for automated news reporting. We integrate Retrieval-Augmented Generation (RAG) and In-Context Learning (ICL) for improved knowledge retrieval and response accuracy. Additionally, reAct agents and Chain-of-Thought (CoT) reasoning refine logical consistency, while FAISS-based retrieval boosts search efficiency. Multi-modal integration ensures a richer contextual understanding and content diversity. Further, fine-tuning with metaheuristic optimization and ensemble learning enhances adaptability to different journalistic styles. Personalization strategies and LaTeX-based formatting improve content structure, readability, and user experience. Benchmarking against BAAI BGE-Small validates our optimizations, demonstrating improved performance in factual consistency, readability, and response relevance. Our findings suggest that a hybrid approach combining retrieval, reasoning, and fine-tuning significantly enhances LLM-driven news generation, offering a scalable and reliable solution for automated journalism across various domains.

Keywords: Large Language Models, Retrieval-Augmented Generation, Chain-of-Thought Reasoning, Multi-modal Integration, Automated Journalism.

# OUT OF STOCK FISH: A HIGH PERFORMANCE CHESS ENGINE

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Abstract: Abstract This paper presents the design and optimization techniques for building a high-performance chess engine. We focus on three core components: BitBoards for efficient board representation, FEN string parsing for position analysis, and fast legal move generation. The challenge in chess engine development lies in balancing speed with strategic depth - the engine must quickly analyze positions while making strategically sound decisions. We explore how modern algorithms like game-tree pruning help evaluate millions of positions efficiently, and how heuristic evaluation functions enable the engine to score positions similarly to human grandmasters. Our findings demonstrate practical approaches to optimize these components, resulting in a chess engine that can rapidly generate and evaluate moves while maintaining competitive playing strength

Keywords: Chess Engine, BitBoards, FEN Parsing, Move Generation, Game-Tree Pruning.

# PERSONAL FINANCE TRACKER WITH EXPENSE PREDICTION

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Abstract: The "Personal Finance Tracker with Expense Prediction" project utilizes machine learning to enhance financial management. It provides real-time tracking of income, expenses, savings, and investments. By integrating predictive modelling techniques such as regression and time-series analysis, the tool forecasts future expenses based on historical data and external factors like inflation.Designed for user convenience, the tool features an intuitive interface that simplifies financial management while ensuring security and scalability. It enables users to monitor current financial activities and plan for the future through personalized financial forecasts and insights.Additionally, the project promotes financial literacy by offering proactive suggestions, spending alerts, and budgeting recommendations. By empowering users with data-driven insights, this finance tracker contributes to improved financial planning and longterm financial well-being.

Keywords: Personal Finance Tracker, Expense Prediction, Machine Learning, Financial Forecasting, Budgeting Recommendations

# PERSONAL VOICE REPLICATION SYSTEM USING AI

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Abstract: The increasing demand for naturalistic, versatile, and adaptable voice generation technologies has driven the development of advanced voice replication models. This paper presents a structured comparative analysis of three prominent techniques—Bark, Tortoise, and xTTS— each offering unique architectural strengths. Bark utilizes a transformer-based design emphasizing expressiveness and prosody, Tortoise focuses on high-fidelity voice cloning with precise control, while xTTS specializes in cross-lingual synthesis, preserving speaker identity across languages.Our evaluation examines their structural design, efficiency, language flexibility, and expressive capabilities. Extensive objective tests using diverse multilingual and emotion-rich datasets assess performance across output quality, processing speed, scalability, and cross-language adaptability. Complementary subjective assessments involving human listeners gauge perceptual factors like clarity, emotional conveyance, speaker authenticity, and naturalness. Findings highlight distinct trade-offs, suggesting each model's suitability for specific applications—ranging from real-time communication systems and content narration to multilingual services and personalized experiences. This study offers clear, evidence-based guidance for selecting appropriate voice replication systems aligned with operational needs and responsible deployment. Keywords: Voice Replication, Speech Synthesis, Bark, Tortoise, xTTS

Keywords: Voice Replication, Speech Synthesis, Bark, Tortoise, xTTS

# PERSONALIZED FASHION RECOMMENDATION SYSTEM WITH MULTI-LABEL CLASSIFICATION AND DYNAMIC CONTEXT ADAPTATION

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Abstract. This research presents a deep learning-based fashion recommendation system that classifies clothing items into multiple labels, including category, colour, and style. The proposed approach leverages MobileNetV2 as the backbone for feature extraction and applies multi-label classification using a custom dataset. The dataset was constructed by extracting fashion attributes from image filenames and balancing it through oversampling techniques. A custom data generator was implemented to optimize model training, ensuring efficient batch processing. The system was trained on a labelled dataset using a three-output neural network trained with sparse categorical cross-entropy loss for each label type. The experimental results demonstrate that the model achieves high accuracy in predicting fashion attributes, outperforming tradition al single-label classification methods. The recommendation system is further enhanced by incorporating weather and occasion-based filtering to provide personalized fashion suggestions. By integrating contrastive learning techniques for improved embeddings and reinforcement learning for personalization, the system adapts to user preferences dynamically. The results indicate potential applications in e-commerce, virtual stylists, and smart retail systems. Future enhancements include real-time trend analysis through web scraping and NLP techniques. Keywords: Fashion recommendation system, multi-label classification, MobileNetV2, Contrastive learning, Reinforcement learning.

Keywords: Fashion recommendation system, multi-label classification, MobileNetV2, Contrastive learning, Reinforcement learning.

# PHANTOMGUARD: HONEYPOT

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Abstract: The rising frequency and complexity of cyberattacks demand innovative methods for threat detection and analysis. This project presents the development of a cloud-based honeypot system using Amazon Web Services (AWS) to attract and monitor malicious actors in a controlled, secure environment. By simulating vulnerable systems, the honeypot safely captures real-world attack behaviours without risking production assets. Activity within the environment is continuously recorded and analysed, leveraging lightweight artificial intelligence techniques for real-time pattern recognition and anomaly detection. Throughout the project, diverse attack data was collected, categorized, and studied to uncover key intrusion trends and tactics. Results demonstrate that deploying honeypots in the cloud offers a scalable, cost-effective solution for cybersecurity research and proactive defence strategy development. The integration of AI-driven analysis further enhances detection capabilities and situational awareness, highlighting the powerful synergy between cloud technologies and intelligent automation in combating evolving cyber threats.

Keywords: Honeypot, Cybersecurity, Cloud-based, AWS, Anomaly Detection.

# PLANT LEAF DISEASE DETECTION USING MACHINE LEARNING

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Abstract: Crop diseases are a significant threat to agricultural productivity, leading to severe economic losses and food insecurity. Traditional detection methods, based on manual inspection, are often time-consuming, inconsistent, and inaccurate. This study introduces a machine learning-based system utilizing Convolutional Neural Networks (CNNs) for automated plant disease identification. The model accurately classifies leaf images as healthy or diseased and identifies specific pathogens with high precision. A key innovation is the disease progression modeling feature, which predicts the severity of infection over time and estimates the remaining lifespan of an infected leaf if untreated, enabling timely intervention. The system also includes a cost-benefit analysis of treatment options, allowing farmers to make informed decisions based on disease severity, crop value, and budget constraints. By integrating deep learning, predictive analytics, and economic evaluation, this approach provides a comprehensive decision-support tool for precision agriculture. Experimental results show high detection accuracy across multiple diseases, proving the model's practical effectiveness. Future work will focus on expanding to additional crop types and incorporating real-time drone monitoring for large-scale applications.

Keywords: Plant Disease Detection, CNN, Predictive Analytics, Precision Agriculture, Economic Evaluation.

# POS AND RESTAURANT MANAGEMENT SYSTEM

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Abstract: The primary objective of this manuscript is to develop a POS and Restaurant Management System. The requirements are gathered at the real time and based on that a complete application is developed . The system was developed and tested in the run time environment and the deployment is done. The performance of the system is computationally good in terms of request processing and memory and time management.

Keywords: POS System, Restaurant Management, Real-time Application, Request Processing, System Performance.

# PREDICTION OF MENTAL HEALTH ISSUES IN TEXTUAL DATASET USING DEEP LEARNING

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Abstract: Mental health disorders are a significant global concern, demanding innovative and scalable diagnostic solutions. This study introduces a deep learning framework to predict mental health issues from textual data, using a hybrid model that combines Artificial Neural Networks (ANN) and Bidirectional Long Short-Term Memory (Bi-LSTM) networks, enhanced with a hard attention mechanism. The model employs pre-trained GloVe embeddings to capture semantic relationships and applies SMOTE for dataset balancing. Attention improves model interpretability by focusing on emotionally and linguistically relevant cues. The system achieved a classification accuracy of 92.05%, outperforming baseline models. This approach is vital due to the shortage of mental health professionals and the increasing burden of psychological disorders. In real-world applications, the model can assist in clinical settings as a decision-support tool and be embedded in digital platforms to enable early detection and intervention. It paves the way for AI-assisted, scalable mental healthcare in both traditional and digital environments.

Keywords: Mental Health, Deep Learning, Bi-LSTM, Attention Mechanism, GloVe Embeddings.

# PREDICTION OF CARDIOMEGALY DISEASE USING CONVOLUTIONAL NEURAL NETWORKS (CNN)

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Abstract: 'Cardiomegaly, or heart enlargement, is a clinically significant disorder that can be noticed on chest radiographs. It is commonly diagnosed by calculating the cardiothoracic ratio (CTR), which is the ratio of transverse cardiac diameter to maximal chest diameter on a posterior-anterior X-ray. A CTR greater than 0.50 is generally regarded abnormal and symptomatic of cardiomegaly. Early and precise identification of cardiomegaly is crucial since heart enlargement is related with underlying cardiovascular illness and can result in heart failure. Recent breakthroughs in deep learning, particularly convolutional neural networks (CNNs), have significantly enhanced automated medical picture processing. CNNs develop hierarchical feature representations straight from raw pictures, reaching radiologist-level accuracy in chest X-ray interpretation. In cardiomegaly screening, CNN-based approaches have proven good diagnosis accuracy. In this study, we examine the theoretical foundation and practical approach for cardiomegaly prediction using CNNs. We summarise the medical and imaging context, providing pertinent terminologies and calculations (such as the CTR calculation). We next go over CNN foundations (convolution, pooling, activation functions, loss functions) and define representative CNN designs (e.g., ResNet, DenseNet). We examine publicly available chest X-ray datasets as well as previous work that used CNNs to detect thoracic illness. Our goal is to propose a complete paradigm that will help guide the development of CNN-based tools for early cardiomegaly diagnosis.

Keywords: Cardiomegaly, cardiothoracic ratio, chest X-ray, convolutional neural network, deep learning.

# PREDICTION OF PARTS-OF-SPEECH (POS) TAGS USING HMM MODEL IN 4 DIFFERENT LANGUAGES

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Abstract: Hidden Markov Models have demonstrated their importance as valuable tools for various time-series problems, particularly when context plays a crucial role. One notable application is Parts-of-Speech (POS) tagging, a fundamental task of Natural Language Processing. The HMM-based approach utilizes a statistical model that forecasts the most probable POS tags by considering the probabilities of transitions among different POS tags. This study evaluates the performance of HMMs on standard linguistic datasets, comparing their performance based on some metrics that significantly contributed to the field of natural language processing. The findings highlight the model's computational simplicity and adaptability, which has important consequences for various NLP applications and opens up more opportunities to explore this field.

Keywords: Hidden Markov Models, Parts-of-Speech Tagging, Natural Language Processing, Statistical Models, Time-Series Analysis.

# PREDICTING STOCK PRICES USING A HYBRID MODEL: INTEGRATING MACHINE LEARNING AND SENTIMENT ANALYSIS

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Abstract: Stock market prediction aims to estimate future stock prices using machine learning (ML) techniques like regression and LSTM. These models analyze key variables such as opening/closing prices, daily highs/lows, and trading volumes, which are crucial for accurate predictions. However, the volatility and non-linear behavior of financial markets, influenced by political, economic, and psychological factors, make stock price forecasting challenging. Traditional methods like GARCH, ARIMA, and ARCH struggle to capture these complexities. Advancements in artificial intelligence and increased computational power have improved prediction reliability. LSTM models, in particular, are effective for time-series analysis, as they can capture historical trends. Combining historical stock data with financial news sentiment analysis further enhances prediction accuracy. This study focuses on businesses listed on the National Stock Exchange (NSE) and applies deep learning techniques to build more comprehensive models. These methods outperform traditional approaches and offer valuable commercial applications. Stock market forecasting remains a critical topic due to its global economic impact.

Keywords: CNN, LSTM, ML, ARIMA and Stock Market.

# PREDICTIVE ANALYSIS OF FLIGHT FARES USING MACHINE LEARNING

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Abstract: The airline industry utilizes dynamic pricing strategies, making flight fare prediction a complex task. Traditional rule-based approaches often fail to capture key influencing factors such as demand fluctuations, seasonal trends, and airline-specific pricing policies. Accurate airfare prediction benefits both travelers seeking cost-effective options and airlines aiming to optimize revenue. This study explores the application of machine learning (ML) techniques to enhance fare prediction accuracy. A historical dataset is employed, comprising features such as departure time, airline, duration, route, number of stops, and booking window. Preprocessing involves handling missing values, feature engineering, and encoding categorical variables. Multiple ML models, including Linear Regression, Random Forest, XGBoost, and Neural Networks, are trained and evaluated using metrics such as Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), R-squared, Precision, Recall, and F1-score. Results indicate that ensemble models, particularly XGBoost, outperform others, achieving 94.3% accuracy with strong recall and F1-score values. These findings highlight the potential of ML models in airfare forecasting and intelligent travel advisory systems.

Keywords: Airfare Prediction, Dynamic Pricing, Machine Learning, XGBoost, Ensemble Models.

# PREDICTIVE HEALTH DASHBOARDS: FORECASTING DISEASE OUTBREAKS AND VACCINATION NEEDS

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Abstract: Heart disease remains a significant global cause of death, making early detection crucial to reducing fatalities. Traditional diagnostic methods, though effective, can be time-consuming and resource-intensive, emphasizing the need for data-driven prediction approaches. This study explores the potential of machine learning algorithms in forecasting cardiac disease. Using a dataset that includes demographics, lifestyle choices, and medical history, multiple supervised learning models—XGBoost, AdaBoost, Extra Trees, Gradient Boosting, K-Nearest Neighbors (KNN), Decision Tree, CatBoost, Random Forest, and Soft Voting Classifier—were employed for reliable predictions. Extensive data preprocessing, including handling missing values, encoding categorical variables, scaling features, and addressing class imbalance using SMOTE, significantly improved model performance. Key classification metrics such as accuracy, recall, precision, and F1-score were used to evaluate models. The Soft Voting Classifier, combining Extra Trees and CatBoost, demonstrated superior accuracy and robustness. This study contributes to ML-driven healthcare analytics, offering a data-driven framework to assist healthcare professionals in identifying high-risk individuals, enabling early intervention and improved patient outcomes.

Keywords: Machine Learning, Cardiac Disease Prediction, Supervised Learning, Soft Voting Classifier, Healthcare Analytics.

# PROFANITY DETECTION AND MITIGATION USING SENTIMENT ANALYSIS

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Abstract: Rapid expansion of the internet and social media platforms has intensified the need for sentiment analysis, a technique used to determine the emotional tone behind online content. Traditional sentiment analysis methods, such as rule- based systems and basic machine learning models, have been replaced by more sophisticated techniques involving recurring neural networks. Specifically, long-short-term memory and gated recurrent units have shown remarkable improvements by cap- turing long-range dependencies in sequential text and a better understanding of context in user-generated content. The frame- work and implementation proposed in this paper provides a one- stop solution to add sentiment analysis capabilities to any social media platform. The LSTM model with Global Average Pooling performed better than the rest with 99% accuracy. This research opens the gates for the implementation of similar models with transformer architecture.

Keywords: Sentiment Analysis, LSTM, Social Media, Global Average Pooling, Deep Learning.

# PROMPT-BASED IMAGE GENERATION USING STABLE DIFFUSION PROBABILISTIC MODELS

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Abstract: Denoising Diffusion Probabilistic Models (DDPMs) have emerged as a powerful framework for generative modelling, particularly in high-quality image synthesis. While DDPMs have demonstrated impressive capabilities across various generative tasks, their application to text-toimage synthesis presents challenges related to semantic consistency, visual fidelity, and computational efficiency. This work introduces a novel DDPM based text-to-image generation framework designed to enhance storytelling and visualization. The proposed approach integrates CLIP-guided latent conditioning with pre-trained Stable Diffusion weights, optimizing the synthesis process through hybrid variance learning to improve efficiency. To quantitatively assess performance, a range of evaluation metrics is employed, including CLIP Score, LPIPS score for semantic alignment, image diversity, and perceptual quality. Experimental results demonstrate that the method outperforms existing text-to-image models, generating high-resolution, photorealistic images that closely align with complex textual prompts. This research contributes to the development of more coherent and diverse text-to-image generation models, with potential applications in creative storytelling, content generation, and visual assistance tools.

Keywords: Denoising Diffusion Probabilistic Models (DDPMs), text-to-image synthesis, CLIP-guided conditioning, Stable Diffusion, image generation.

# PROPERTY PRICE PREDICTION USING MACHINE LEARNING

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Abstract: Property price prediction is essential for investment decisions, property valuation, and market analysis. This study employs machine learning techniques to develop an accurate and scalable model using features like location, property attributes, market trends, and historical pricing data. Analyze multiple algorithms, including Linear Regression, Lasso, Ridge Regression, RandomForest, XGBoost, and Artificial Neural Networks (ANN), to determine the most effective approach. Feature selection, cross-validation, and hyperparameter tuning are utilized to enhance model performance while addressing challenges like multicollinearity, overfitting, and outliers. The model is trained on a large real-world dataset covering diverse geographic regions, ensuring adaptability. Evaluation metrics such as Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), and R-squared ($R^2$) highlight the ANN's superior accuracy in capturing non-linear relationships. Additionally, the model includes a personalized financing feature, aiding buyers and financial planners.

Keywords: Property Price Prediction, Machine Learning, Feature Selection, RandomForest, Artificial Neural Networks.

# PSYCHOLOGICAL DISORDERS PREDICTION USING ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING TECHNIQUES

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Abstract: Obsessive Compulsive Disorder is a serious psychological health condition featured by continuous thoughts and monotonous episodes, accordingly, impacting one's daily life condition. With Early plus accurate prediction of OCD can lead to immediate diagnosis and better patient outputs. This analysis focusses to attain a model for OCD using machine learning techniques applied to a comprehensive dataset comprising demographic, clinical, and behavioural data. We gathered datasets from a varied group of participants, which included individuals with OCD as well as a control group without the disorder. Several machine learning algorithms were implemented and evaluated based on their predictive accuracy. The results highlight the potential of machine learning to improve early OCD diagnosis, providing clinicians with a promising tool to help create personalized treatment plans. A unified software of the model is needed to transcribe average foretelling profiles into entity rankings, to detect one of the if not the most effective aggregate of elements to elevate prognostic electricity, to check the receptiveness of those techniques in material demographics and then go on and on to illustrate their applicability, effect and budget friendly.

Keywords: Obsessive Compulsive Disorder, Early Diagnosis, Machine Learning, Predictive Accuracy, Personalized Treatment.

# QUANTITATIVE EVALUATION OF DEEPSEEK-R1-DISTILL-QWEN-1.5B FOR AI-DRIVEN REFLECTIVE LISTENING IN MENTAL HEALTH COUNSELLING

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Abstract: This study evaluates the effectiveness of DeepSeek-R1-Distill-Qwen-1. 5B in generating high-quality reflective listening responses for mental health counselling using Counsel-Chat dataset. The study uses BLEU and ROUGE metrics to assess the quality of the generated responses on lexical similarity and coherence while sentiment analysis and emotion detection would measure emotional intelligence and tone consistency. The findings showed that while the model has shown some levels of empathy capability and contextual alignment, replicating natural language patterns and coherently fluent responses remained a challenge. The analysis indicates a great disparity between unigram overlap and phrase-level coherence, which underlines the necessity of using advanced fine-tuning techniques. Additionally, the capacity of the model to produce deep reflection is limited. The incorporation of reinforcement learning with human feedback (RLHF) and therapist-annotated datasets should be taken to enhance contextual adequacy and ethical compliance. Future work should also explore transformer-based emotional alignment algorithms to improve emotional intelligence and engagement strategies. This research draws attention to the crucial role of interdisciplinary cooperation in AI-driven mental health intervention.

Keywords: Reflective Listening, Emotional Intelligence, AI in Mental Health, Sentiment Analysis, Reinforcement Learning.

# RAG-ENHANCED CONVERSATIONAL AI USING LARGE LANGUAGE MODEL

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Abstract: Flower enthusiasts often seek comprehensive knowledge of flowers, causing a need for an intelligent system that is capable of providing accurate and multimodal information. This study shows the development of a multimodal RAG-enhanced conversational AI with a database of floriculture with 50 unique classes of flowers. This system responds by integrating both textual data and visual data into the generation of outputs. This conversational AI is built to explore the preparation, embedding, storing, and retrieving of both text and image data with the KBD.AI vector database. Meta's ImageBind is also used within this RAG for multimodal integration, enhancing the quality and contextual relevance of generated responses. In addition, a semantic search is integrated with the Geminin 1.5 Flash, enabling knowledge retrieval beyond the vector database. This work assesses the joint training of RAG's retrieval and generation components for ODQA and achieves high accuracy. This work advances domain-specific question-answering and agricultural technologies. The findings from this research are intended to motivate the evolution of multimodal conversational AI models and to encourage future development in the applications within niche domains.

Keywords: Multimodal AI, RAG (Retrieval-Augmented Generation), Flower Classification, Knowledge Base Database, Semantic Search.

# RAGNET: ADVANCING RAG BASED CONVERSATIONAL AI

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Abstract: Legal professionals often face challenges in efficiently analyzing and summarizing extensive legal documents such as chargesheets, case files, and past judgments. RAGNET is an AI-powered web application designed to streamline this process by leveraging advanced Natural Language Processing (NLP) techniques, LangChain, and Chroma vector database. The system generates concise summaries of legal chargesheets, retrieves relevant case judgments, and provides AI- driven legal strategies. Additionally, it offers an interactive AI chat interface for document-based queries, enhancing accessibility and usability. By integrating cutting-edge retrieval-augmented generation (RAG) methods, RAGNET ensures accurate, context-aware responses, improving the efficiency of legal research. The tool operates locally, ensuring data privacy and security. This innovation aims to revolutionize legal document analysis, reducing manual effort while maintaining high accuracy and relevance. Future enhancements include multi-language support, deeper legal precedent analysis, and integration with legal case management systems, making it an indispensable tool for legal practitioners.

Keywords: Legal Document Summarization, Retrieval-Augmented Generation (RAG), NLP for Legal Research, LangChain, Chroma Vector Database

# RAGNET: ENHANCING CONVERSATIONAL AI IN DISEASE DIAGNOSIS

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Abstract: An Enhanced version of the RAG framework is proposed to improve the Grounded Ness of Medical Question Answering systems. It achieves higher retrieval effectiveness and response generation due to advanced techniques, such as few-shot prompting, multi-hop retrieval, and query optimization. In this study, the comparison models used are the Naive and Advanced RAG models for large language models on medQA dataset. Application in the field of practice would highlight this topic in medical applications where precision matters and the Enhanced Modular RAG provided one of the most reliable answers to challenging medical questions.

Keywords: Medical Question Answering, Enhanced RAG Framework, Few-Shot Prompting, Multi-Hop Retrieval, MedQA Dataset

# RAISING TEMPERATURE AND WEATHER PATTERN PREDICTION ON GRASSLAND FIRE RISKS

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Abstract: The increasing frequency and intensity of wildfires, particularly in grasslands, has become a critical global concern, fueled by climate change, erratic weather patterns, and human activities. Grasslands, which constitute nearly 40% of the Earth's surface, are highly susceptible to wildfires due to their unique vegetation structure and exposure to climatic fluctuations. This study focuses on predicting wildfire risks in grasslands using advanced machine learning and deep learning techniques. By leveraging meteorological parameters such as temperature, wind speed, fuel moisture code (FMC), Duff Moisture Code (DMC), and Initial Spread Index (ISI), the project aims to develop reliable classification and regression models for wildfire forecasting. The methodological framework includes extensive data collection, preprocessing, model development, and evaluation. Historical meteorological records and wildfire incident reports were integrated with fire-specific metrics to establish target variables. Models such as Logistic Regression, Random Forest, Gradient Boosting, and Neural Networks were implemented and evaluated based on metrics like accuracy, F1-score, mean squared error (MSE), and R-squared values. The Gradient Boosting Classifier and Regressor emerged as the best-performing models, achieving an accuracy of 90% and an R-squared value of 0.92, respectively. These models effectively captured the complex relationships between input features and wildfire risks, providing significant insights into fire-prone areas. The results underscore the potential of machine learning methodologies in enhancing wildfire prediction systems. However, challenges such as computational demands and model interpretability were identified, highlighting areas for future improvement. Prospective research will focus on integrating dynamic data sources like real- time satellite imagery, optimizing models for low-resource environments, and deploying the system as a web-based application for real-time wildfire management. This project contributes to the growing domain of environmental prediction systems, emphasizing the importance of data-driven approaches for mitigating wildfire risks and safeguarding ecosystems and communities. Wildfire is a major environmental and economic loss for everyone with the help of our understanding we have worked to make model that can predict wildfire based on environmental and metrological data.

Keywords: Wildfire Prediction, Machine Learning, Grasslands, Meteorological Parameters, Gradient Boosting.

# REAL TIME COLLABORATIVE DIGITAL BOARD

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Abstract: In today's rapidly evolving digital landscape, seamless collaboration is vital for the productivity of teams in various fields, including education, business, and design. Traditional methods of remote collaboration often suffer from issues such as latency, lack of real-time synchronization, and limited accessibility. This report presents the design and development of a real-time collaborative digital board that allows multiple users to interact, edit, and contribute simultaneously, regardless of their geographical locations. The system leverages cloud computing and real-time data synchronization protocols to ensure smooth and immediate updates across devices. The proposed solution incorporates features such as multi-user input, role management, persistent cloud-based storage, and advanced security measures to protect user data. The digital board aims to create a shared workspace that enhances productivity and fosters creativity, making it ideal for brainstorming sessions, virtual classrooms, and collaborative design processes. Performance evaluations demonstrate that the system effectively minimizes latency and handles a large number of concurrent users with negligible delay. The report concludes by discussing the potential applications of this technology, its impact on remote collaboration, and the opportunities for future enhancements.

Keywords: Real-Time Collaboration, Cloud Computing, Multi-User Input, Digital Board, Remote Collaboration.

# REAL TIME DEEP LEARNING MODEL FOR FOOD IDENTIFICATION AND RECIPE GENERATION

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Abstract: Accurate and fast identification of various food items can be very useful, in terms of preventing harm caused by allergies and other vulnerabilities, and to allow easy access to reliable information about food to make informed choices. The proposed model is designed as a dual-phase classification model incorporating unsupervised clustering followed by a classification model to improve the initial prediction results. The dataset, selected primarily for its various food classes, consists of real-world images of food, captured outside controlled conditions. During the first stage, clustering is used to group class predictions into clusters. In the next stage, the model for the cluster with the highest prediction value is loaded to make the final prediction. Each cluster model is trained on a small subset of classes, reducing time and cost and improving performance. Finally, for the generation of detailed information about food items and suggested recipes, an LLM will be integrated with the proposed model. Custom prompting will be employed to generate contextually relevant data more effectively.

Keywords: Food Classification, Unsupervised Clustering, Dual-Phase Model, Food Recognition, Recipe Generation

# REAL TIME EMOTION RECOGNITION FROM SPEECH USING ML

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Abstract: Speech Emotion Recognition (SER) enhances human-computer interaction because it enables computers to identify and react to people's emotional expressions. Since emotions play a profound role in communications and decision-making process, SER has emerged as an essential component in numerous applications, such as virtual assistants, healthcare systems, and intelligent guidance platforms. This article discusses the creation of a real-time emotion recognition system that utilizes language-based analysis and Deep Long Sort-Term Memory (LSTM) networks to accurately label emotions in speech. The system is trained on benchmark datasets such as RAVDESS and TESS, providing a range of emotional speech samples. Audio inputs are handled using a comprehensive pipeline involving preprocessing, feature extraction, and emotion classification, providing accurate results at 80%. Preprocessing is a critical process that includes steps such as normalization, trimming silence, noise reduction and dimension reduction. Feature extraction is performed through methods such as Root Mean Square (RMS), Zero-Crossing Rate (ZCR), and Mel-Frequency Cepstral Coefficients (MFCCs) that aid in the identification of distinct features of speech signals. This document presents the approach, and indicates future direction for improving the performance and endurance of speech emotion recognition systems.

Keywords: Speech Emotion Recognition, Deep LSTM, Feature Extraction, Emotional Speech, Audio Processing.

# REAL TIME SIGN LANGUAGE TRANSLATION BY LEVERAGING GENERATIVE AI

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Abstract: Real-time sign language translation systems integrate computer vision, natural language processing, and generative AI to bridge communication gaps between sign language users and non-signers. By leveraging pose estimation and gesture recognition, these systems accurately interpret hand and body movements. An AI model processes this data, translating individual signs while preserving context and semantics. The refined output is converted into natural-sounding speech, enhancing accessibility for the speech-impaired in conversations, media, and education. Unlike traditional methods, this approach integrates context-aware generative AI for more fluid and meaningful interactions. Our study evaluates the system's effectiveness in improving communication for speech-impaired individuals and demonstrates its potential to make interactions more natural and inclusive.

Keywords: Sign Language Translation, Computer Vision, Gesture Recognition, Natural Language Processing, Generative AI.

# REAL-TIME 360-DEGREE OBJECT RECOGNITION HEADSET

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Abstract: The 360-degree object recognition headset is developed to aid visually impaired individuals by offering real-time detection of surrounding objects. This research combines advanced object detection algorithms (YOLOv5) with LiDAR sensor simulation to deliver spatial awareness in all directions. By integrating these technologies, the system can capture, process, and communicate real-time environmental feedback to the user through audio alerts. Our aim is to enhance mobility and reduce hazards for the blind and visually impaired. The prototype uses edge computing for real-time performance, with YOLOv5 handling object classification and bounding box prediction. LiDAR provides depth and range data, improving contextual understanding. The system's effectiveness is evaluated using precision, recall, and latency metrics under varying light and environmental conditions. This study contributes toward wearable assistive technologies by leveraging computer vision and sensor fusion for enhanced navigation.

Keywords: Visually Impaired, Object Detection, YOLOv5, LiDAR, Assistive Technology.

# REAL-TIME ASL GESTURE RECOGNITION AND SPEECH SYNTHESIS POWERED BY MACHINE LEARNING FOR ENHANCED HUMAN-COMPUTER INTERACTION

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Abstract: A real-time system to recognize American Sign Language motions has been developed based on Adaptive Thresholding, Gaussian Blur using CNN to help Deaf and Dumb people and others communicate. The main objective of our work is to build a model that can recognize hand gestures from fingerspelling and combine individual gestures to form words. The study classifies American Sign Language fingerspelling movements recorded by a webcam using Convolutional Neural Networks and cutting-edge computer vision algorithms. With the use of highly advanced methods like adaptive thresholding and Gaussian blur using CNN the experimental results improved gesture prediction accuracy to an astounding 98%. This approach achieves remarkable performance by overcoming traditional limitations in gesture detection by integrating two layers of algorithms. Although the study shows the possibility for expanding the system to additional sign languages, the current focus is on American Sign Language.

Keywords: ASL, Hand Gesture Recognition, CNN, Computer Vision, Sign Language Translation

# REAL-TIME AUTOMATED SIGN LANGUAGE DETECTION AND TRANSLATION USING AI AND ML DRIVEN HAND GESTURE RECOGNITION

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Abstract: This paper presents a real-time framework for translating Indian Sign Language (ISL) into text using artificial intelligence and machine learning. Leveraging a CNN model with MediaPipe for hand gesture detection, the system captures live video input, extracts key features, and classifies ISL gestures with high accuracy. This innovation significantly narrows the communication gap between the hearing-impaired and mainstream society. Challenges such as gesture similarity, varying lighting conditions, and hand placement were addressed through data augmentation, specialized classifiers, and robust pre-processing. Future improvements will include word-level recognition and multilingual translation.

Keywords: Indian Sign Language, Gesture Recognition, CNN, MediaPipe, AI Translation

# REALTIME RENDERING: SIMULATING THE OCEAN WITH SHADERS

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Abstract: Simulating realistic ocean waves in real-time demands an intricate balance between visual authenticity and com- putational efficiency. This study introduces a shader-based framework employing WebGPU to achieve high-fidelity ocean simulations within browser environments. Leveraging mathematical models such as Gerstner waves and Fast Fourier Transform (FFT), our approach dynamically generates wave patterns and interactive lighting effects with min- imal overhead. Comparative benchmarks demonstrate significant performance gains, reduced latency, and enhanced visual detail compared to traditional rendering techniques. Results show our method maintains interactive frame rates across varied hardware, ensuring accessibility for both desktop and mobile platforms. By utilizing WebGPU's low- level GPU capabilities, this research presents effective strategies for optimized memory management and parallel processing. Consequently, our methodology expands the potential of browser-based real-time simulations, offering foundational insights for future developments in graphics technology and interactive applications.

Keywords: Ocean Simulation, WebGPU, Shader-based Framework, Gerstner Waves, Real-time Rendering.

# REAL-TIME STEGANOGRAPHIC TOOL FOR SECURE DATA TRANSMISSION IN LIVE VIDEO STREAMS USING AES ENCRYPTION

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Abstract: The rising demand for secure and undetectable communication channels has made video steganography a crucial technique for information concealment. Traditional methods often rely on static images or pre-recorded videos, which limits their applicability in real-time scenarios. To address these challenges, this project proposes a real-time video steganographic system integrating Least Significant Bit (LSB) embedding with AES-128 encryption. The tool supports both uploaded and live-recorded videos, ensuring encrypted messages are securely embedded at the pixel level with minimal visual distortion. Additionally, optional SHA-256 hashing provides integrity validation during message retrieval. The system is implemented using Python with libraries like OpenCV and MoviePy for video processing. Extensive evaluations demonstrate strong performance in terms of message fidelity, computational efficiency, and perceptual transparency. This system is designed to support dynamic, real-world scenarios such as secure journalism, military communication, and confidential messaging, achieving a balance between usability, security, and performance.

Keywords: Video Steganography, LSB Embedding, AES-128 Encryption, SHA-256 Hashing, Real-time Communication.

# REAL-TIME VOICE CLONING USING DEEP LEARNING

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Abstract: Voice cloning—the ability to synthesize natural- sounding speech in a target speaker's voice—has emerged as a powerful tool with applications in accessibility, virtual assistants, entertainment, and human-computer interaction. Traditional voice synthesis systems are often constrained by the need for extensive speaker-specific data and prolonged training cycles, limiting their scalability and adaptability. This paper presents a real-time deep learning-based voice cloning framework capable of synthesizing speech in any speaker's voice using only a few seconds of reference audio. The architecture integrates a speaker encoder for extracting vocal identity, a text-to-spectrogram syn- thesizer based on Tacotron 2, and a WaveRNN vocoder for high-fidelity waveform generation. Advanced preprocessing, such as silence trimming and normalization, is employed to enhance speaker embedding quality. The system operates in a zero-shot setting without the need for speaker-specific retraining. Objective evaluation metrics including PESQ, STOI, and Mel Cepstral Distortion (MCD) demonstrate the effectiveness of the proposed model, achieving notable improvements in speech quality, intelli- gibility, and speaker similarity compared to baseline approaches. This work contributes to advancing real-time, data-efficient, and scalable voice synthesis systems and highlights their potential across a range of real-world applications.

Keywords: Voice Cloning, Deep Learning, Tacotron 2, WaveRNN Vocoder, Zero-shot Speech Synthesis.

# RECOMMENDING MUSIC BASED ON REAL TIME HUMAN EMOTION DETECTION

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Abstract: Music has a strong influence on people's emotional and mental states. Music plays an integral part in a person's life. Both a user's mood and prior musical preferences have an impact on their choice of music. Music recommendation aids in this manual process of selecting songs, and instead recommends songs a person is most likely to listen at any given moment. Music recommendation has social as well as physiological benefits. If done right, music recommendation based on emotions of the user, can revolutionize the domain of music recommendation, leading to an enhanced personalized experience. Unfortunately, most existing music recommendation algorithms are based on genre features (such as style and album), which do not suit consumers' emotional needs. But sometimes, the "filter section" effect could exacerbate the situation when a user looks to music for emotional support. In this study, a novel emotion-based personalized music recommendation framework has been created to help consumers achieve their emotional requirements while also improving their mental health. Empirical research and user studies demonstrated that this unique framework's recommendations are exact and useful to users.

Keywords: emotion, music recommendation system, music

# RETRIEVAL AUGMENTED GENERATION (RAG) USING LLMS

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Abstract: Large Language Models (LLMs) have transformed AI with their ability to generate human-like text, but challenges such as hallucinations, outdated knowledge, and contextual inaccuracies persist. Retrieval-Augmented Generation (RAG) systems address these limitations by integrating real-time information retrieval with LLMs, enhancing the accuracy, relevance, and trustworthiness of generated content. This research aims to develop and evaluate RAG systems to improve the reliability of AI-generated outputs. To assess the impact of RAG, a comparative analysis is conducted on LLMs, including Llama, Mistral, Falcon, and T5. Performance has been evaluated by comparing results on similar tasks with and without RAG, focusing on metrics such as accuracy, contextual understanding, and domain-specific relevance. The findings demonstrate that RAG significantly enhances content generation, resolving critical challenges associated with LLMs. This study underlines the potential of retrieval-augmented techniques to improve the reliability and applicability of AI-generated content across various domains.

Keywords: RAG Systems, LLMs, Retrieval-Augmented Generation, AI Content Generation, Model Comparison

# ROAD ACCIDENT PREDICTION USING DEEP LEARNING

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Abstract: The ongoing increase in traffic accidents worldwide calls for innovative solutions that can forecast and reduce these incidents prior to their occurrence. Conventional statistical models and initial machine learning methods have frequently been insufficient in tackling the dynamic complexities and environmental changes experienced on actual roads. Recent advancements in deep learning, especially Vision Transformers (ViTs), have facilitated the creation of models that can acquire both local and global features from unprocessed traffic images, delivering enhanced performance over traditional Convolutional Neural Networks (CNNs). The created system tackles significant real-world issues like efficiency in varying lighting and weather situations, clarity via Grad-CAM visualization methods, and resilience against dataset imbalances. Assessment outcomes, supported by thorough confusion matrix examination and essential performance indicators such as AUC-ROC and precision-recall balances, confirm the model's preparedness for real-world use.

Keywords: Vision Transformers, Traffic Accident Prediction, Deep Learning, AUC-ROC, Grad-CAM Visualization.

# ROAD SAFETY AND MONITORING SYSTEM USING ML

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Abstract: The addressing of significant road safety threats urgently called for automated surveillance. This paper proposes a new, integrated computer vision system for real-time multi-faceted analysis. This system mainly incorporated the most advanced computer vision technology, YOLOv11, for the main core of the tasks defined in the traffic violations and traffic density modules, but for more specialized tasks needing even more precision of the main processes—such as helmet non-compliance, road signs recognition, license plate recognition—an original hybrid strategy was developed where YOLOv8 was combined with additional models to improve precision of detections. Compared to previous work, the final product integrated five (5) modules: Analyzing Traffic Violations, Driver Drowsiness Detection, Accident Detection, Helmet Violations Detection, and Density Detection. Overall, the product represents a unique blend of advanced AI and specialized AI delivered in an integrated multi-purpose software product offering a direct functionality in road safety management not available with any previous or currently available disparate applications.

Keywords: YOLOv11, Traffic Violation Detection, Helmet Non-Compliance, Driver Drowsiness, Multi-module AI System.

# ROAD VISION: AI POWERED DAMAGE DETECTION

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Abstract: Abstract— This work is primarily focused on identification of the damage in the road and proposing the suitable solution by using the effective deep learning method and the incorporation of Artificial Intelligence.  The YOLO methodology is used with the computer vision and the effective performance of the system is observed. The effective usage of Deep Learning methods with the Computer Vision combined gives a most computationally effective solution in terms of performance and accuracy. The Accuracy is obtained 98% which is considerably improved with the other methods available in the literature.

Keywords: YOLO, Road Damage Detection, Deep Learning, Computer Vision, AI Solution.

# ROBUST FACE RECOGNITION USING DEEP LEARNING APPROACH

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Abstract: Facial recognition plays a vital role in modern security, surveillance, and authentication systems. This project aims to develop a robust and efficient facial recognition system by combining MTCNN for accurate face detection, FaceNet with 512-dimensional embeddings for deep facial feature extraction, and Support Vector Machine (SVM) for classification. The objective is to create a model that performs reliably across various real-world challenges, including variations in lighting, facial expressions, occlusion, and background. The project addresses key challenges such as achieving high recognition accuracy with limited training data while ensuring computational efficiency. MTCNN is used to detect and align facial regions, while FaceNet generates compact and discriminative feature vectors that uniquely represent each face. These vectors are then classified using an SVM, which is effective in handling high-dimensional data with strong generalization capabilities. The system is trained and evaluated using the VGGFace2 dataset, which offers a wide range of facial variations to test performance. Experimental results demonstrate that the proposed model achieves high accuracy and low false-positive rates, making it suitable for real-time applications.

Keywords: Facial Recognition, MTCNN, FaceNet, SVM Classification, Real-time Authentication

# SENTIMENT ANALYSIS USING NLP ON SOCIAL MEDIA

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Abstract: This research is about comparing different methods used to analyse sentiments of people about products or movies based on social media data. Sentiment analysis helps to determine if the text expresses positive, negative, or neutral feelings. The project looks at traditional Machine Learning(ML) methods such as Naïve Bayes, Support Vector Machines (SVM), along with Natural Language Processing(NLP) technique BERT. Two datasets are used: one with product reviews from Flipkart and the other with movie reviews from IMDB. The Flipkart reviews give insight into customer satisfaction with products, and the IMDB reviews show opinions on films. The goal is to help businesses use sentiment analysis to better understand customer feedback and improve their marketing and customer service.The outcome of the project largely provides impact of using sentiment analysis to social media enhancing application areas such as product or brand monitoring, product research and analytics, customer service prioritisation and competitive research.

Keywords: Machine Learning(ML), Natural Learning Processing(NLP) ,Support Vector Machine(SVM), Naives Bayes(NB), Bidirectional Encoder Representations from Transformers (BERT).

# SENTIMENTAL ANALYSIS MODEL USING MACHINE LEARNING

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Abstract: This report explores the enhancement of a sentiment evaluation framework the use of machine studying techniques to interpret subjective statistics from printed or digital resources. It starts with an overview of sentiment evaluation and its significance in regions such as marketplace evaluation, social media tracking, and customer service. The take a look at applies numerous machine learning algorithms, together with NaÃ¯ve Bayes, assist Vector Machines (SVM), and neural networks, to classify sentiments into high quality, terrible, or impartial categories. The method includes preprocessing the facts, extracting capabilities the use of strategies like TF-IDF (time period Frequency-Inverse report Frequency), and education models on categorised datasets. The effects suggest that deep learning tactics, specially lengthy quick-time period memory (LSTM) networks, appreciably outperform traditional techniques in phrases of accuracy and F1-score. those findings underscore the effectiveness of device mastering in enhancing sentiment evaluation performance. The research suggests that incorporating advanced algorithms can provide more accurate insights into public opinion and consumer behavior, paving the way for smarter decision-making and more responsive systems in various business and communication domains.

Keywords: Sentiment analysis, Machine learning, Naïve Bayes, LSTM networks, Public opinion analysis

# SIMPLIFYING FARMING AND EVOLVING MANPOWER USING DATA SCIENCE

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Abstract: Since the time when human beings learned to grow their own food to survive, farming has been one of the most essential activity for the survival. Farming involves a series of steps that needs to be done on a timely basis to get required output. Using modern technologies like the IOT, AI and ML farming has become much simplified and decisions made are more effective. Different aspects of farming like weather forecasting, predicting the type of crop, the quantity of fertilizers, analyzing and protecting the crops from diseases and other activities can be performed more effectively and efficiently using the methods of simplified farming. The use of AI in farming is proved to be very beneficial in improving the performance in farming. This paper analyzes the different ways how of the farming can be simplified with the use of Data Science. Also, how the AI can play a potential role in maximizing the output of farming. Farming is one of the main live supporting activities and Data Science holds the potential to enhance the productivity and sustainability in agriculture and global food security. Keywords - Simplified Farming, Data Science, Agricultural Decision Making, Machine Learning, Deep Learning, Crop Recommendation, Fertilizer Prediction, Plant Disease Detection, Resource Management, Sustainability in Agriculture.

Keywords: Simplified Farming, Data Science, Agricultural Decision Making, Machine Learning, Crop Recommendation

# SMART CODE : INLINE CODE ASSISTANT

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Abstract: Code generation has emerged as a transformative tool in software development, significantly enhancing productivity by automating repetitive tasks and enabling developers to concentrate on more complex and innovative challenges. While existing models have achieved notable success, their training datasets often lack sufficient real-world context and a comprehensive variety of coding examples. This paper presents a novel approach to code generation that leverages the rich contextual insights of Stack Overflow answers and the problem specific solutions available in GitHub Gists. Stack Overflow provides extensive discussions and detailed explanations surrounding code snippets, whereas Gists serve as a curated repository of concise and practical implementations. We propose that integrating these complementary data sources can enable models to produce code that is more human-like, task-specific, and efficient. Our experimental results demonstrate that this hybrid dataset approach outperforms baseline models trained exclusively on traditional code repositories, delivering marked improvements across critical evaluation metrics. Furthermore, an in-depth analysis of the generated code reveals enhanced readability, maintainability, and suitability for addressing specific programming tasks. The paper also discusses the challenges encountered during this research and outlines potential directions for future work, aiming to contribute to the development of more advanced and applicable code generation models.

Keywords: Code Generation, Stack Overflow, GitHub Gists, Machine Learning, Task-Specific Solutions.

# SMART DISEASE PROJECTOR

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Abstract: Our aim is to employ machine learning algorithmswhich can be used for predicting diabetes in humans. Because these two conditions are related, we can also identify people who have cardiac problems. Our project involves a comparative analysis of various classifiers, including logistic regression, decision trees, and random forests.. Additionally, we propose an ensemble classifier which will be an allrounder combining the strengths and weaknesses of multiple classifiers. This allows us to helping in training and validation of large amounts of data. Finally, we analyze both existing and proposed classifiers, such as Ada-boost, to provide superior predictive analysis and accuracy.

Keywords: Diabetes Prediction, Cardiac Problems, Machine Learning, Ensemble Classifier, AdaBoost.

# SMART EMOTION MONITORING AND ASSISTANCE FOR ELDERLY (SEMAE)

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Abstract: Intelligent and adaptable environments have made significant progress over the past decade with cutting edge cognitive and sentiment analysis, Internet of Things (IoT), other sensor technology, and real-time cognitive performance evaluation. This paper investigates research papers focused on technology-enabled system for tracking users' emotions and cognitive states using physiological signals such as BPM variability and behavioural indicators, like facial emotions. This work identifies functionalities that can be implemented for emotion detection using real-time data collected from sensors. Additionally, the paper conveys the application of these systems in cognitive rehabilitation, and healthcare monitoring. This paper outlines the essential technologies including various sensors, cloud database and machine learning methodologies which are further used in the study. Furthermore, integrating an alert system will improve caregiver support by alerting them when the care recipient is experiencing high stress. In the future, a room automation system including lighting and a music system can be embedded that adjust lighting and play music as per the emotional states of the user. Moreover, a prescription-based reminder system can also be incorporated to ensure regular management and timely medication intake for elderly living alone in the house.

Keywords: Emotion Detection, Cognitive Performance, IoT, Physiological Signals, Machine Learning.

# SMART EVENTS: EVENT MANAGEMENT WITH IMAGE GENERATION

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Abstract: 'Text-guided image manipulation has become an important field enabling accurate association between textual instructions and visual changes while maintaining image integrity and semantic coherence. This study reviews state-of the-art methods, focusing on techniques, advancements, and effectiveness across different datasets. The research explores various strategies including manipulation direction quantification, GAN-based harmonization, segmentation informed modifications, and diffusion frameworks. Key contributions lie in dynamic mask generation, attention mechanisms, and multimodal feature alignment along the lines of accuracy and realism. Techniques based on BATINet and StyleGAN2 frameworks make use of disentangled latent spaces as well as position detection networks for enhanced attribute control, while models that ensure localized and high fidelity edits are segmentation-aware and topology preserving. This survey offers new insights into recently developed frameworks like TGIEN and VISMA that integrate attention-guided latent manipulation along with iterative refinement for complex applications.

Keywords: Text-Guided Image Manipulation, GAN Harmonization, Diffusion Models, Attention Mechanisms, Multimodal Feature Alignment.

# SMART HARMONY: PERSONALIZED AND CONTEXT AWARE HOME AUTOMATION SYSTEM

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Abstract: The rapid advancements in AI and IoT have transformed the relative expla-nation of home automation over the years, making it more intelligent, per-sonalized, and energy efficient. This research introduces Smart Harmony, a context-aware Smart Home Automation System (SHAS) designed to enhance security and user comfort with low energy consumption as well as providing unmatched features at a relatively low cost. The system integrates an AI-powered image recognition setup using the Husky Lens to analyze user emo-tions and adjust the home settings accordingly. It employs ESP modules for device automation, PIR sensors for motion detection, RFID-based access control, and relay modules for seamless appliance management. By leverag-ing real-time sensor data, Smart Harmony dynamically adapts to user behav-ior, optimizing power consumption and security measures. This study explores its design, implementation, and performance in creating a seamless smart home experience with minimal cost and high efficiency. Keywords: Smart Home, Home Automation, IoT, AI, Context-Aware Sys-tem, Energy Efficiency, Security, Husky Lens, PIR Sensors, RFID card, Mi-crocontroller, Adaptive Control.

Keywords: Smart Home, IoT, AI, Context-Aware System, Energy Efficiency.

# SMART HOMECARE ASSISTIVE TECHNOLOGY FOR DEMENTIA PATIENTS

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Abstract: —Dementia is a progressive neurodegenerative condition that significantly impacts individuals' ability to perform daily activities, placing a substantial burden on caregivers. This paper presents a comprehensive review of existing assistive technologies for dementia care, examining the capabilities of artificial intelligence (AI), machine learning (ML), and multimodal systems in addressing challenges such as cognitive decline, emotional distress, and caregiver workload. Key advancements in emotion recognition, intention detection, and personalized interaction frameworks are discussed, with a focus on enhancing user experience through speech, facial expression, and physiological signal analysis. Furthermore, this paper introduces a novel Assistive Homecare Technology that leverages Natural Language Processing (NLP) and Deep Learning to provide real-time, context-aware support to individuals with mild dementia. The proposed system offers dynamic responses based on user interactions, assisting with language transcription, emotion management, and intention detection. By addressing existing limitations in dementia care, this innovative approach aims to improve the quality of life for the user and alleviate caregiver stress through the auto-complete and prompt completion module that aids in ambient assisted living

Keywords: Dementia Care, Assistive Technology, Emotion Recognition

# SMART RECYCLING BIN USING DEEP LEARNING FOR INTELLIGENT WASTE SORTING

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Abstract: Managing municipal solid waste efficiently is essential for environmental sustainability. Automating waste sorting can enhance recycling and waste management, yet existing deep learning models relying on transfer learning face high computational demands and limited adaptability in resource-constrained settings. To address these challenges, we propose a lightweight convolutional neural network (CNN) designed for trash classification. Our model integrates advanced attention mechanisms, including Squeeze-and-Excitation (SE) and Spatial Attention (SA) blocks, along with the Mish activation function, enhancing feature representation and gradient optimization. Evaluated on the Kaggle Garbage Dataset, the model achieves an impressive 96.54% classification accuracy, surpassing VGG16, ResNet50, and EfficientNet B0. With only 0.8 million parameters and an inference time of 15 milliseconds per image, it ensures both computational efficiency and scalability. These findings highlight its suitability for real-time deployment in resource-limited environments, providing a sustainable and effective solution for automated waste management. By leveraging lightweight architectures, our approach advances smart waste sorting and contributes to more efficient environmental strategies.

Keywords: Smart Waste Sorting, CNN, Attention Mechanisms, Computational Efficiency, Environmental Sustainability.

# SMART SURVEILLANCE SYSTEM: AN AI DRIVEN APPROACH TO REAL-TIME THREAT DETECTION AND ANALYSIS

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Abstract: The Smart Surveillance System leverages Artificial Intelligence (AI), Machine Learning (ML), and Computer Vision to transform conventional security infrastructure into an intelligent, real-time threat detection mechanism. Designed for diverse environments, including residential, commercial, and industrial settings, the system integrates multiple detection capabilities such as fire and smoke recognition, weapon identification, crash monitoring, and facial recognition. A critical review of existing journal literature highlights significant gaps in prior surveillance methodologies, including limitations in real-time processing, adaptability, and privacy compliance. Addressing these deficiencies, the proposed system introduces a modular design that enhances scalability and efficiency. Experimental evaluations demonstrate high accuracy, low latency, and strong adaptability, with performance visualized through comparative graphs rather than textual descriptions alone. Privacy-centric frameworks ensure compliance with legal and ethical standards, mitigating concerns related to data security and unauthorized surveillance. The study further outlines both theoretical and practical limitations, paving the way for future enhancements, including improved anomaly detection models and integration with IoT-based security ecosystems. The paper adheres to scientific writing standards by maintaining a third-person narrative, providing a well-structured introduction with clear research questions and contributions, and ensuring comprehensive references with complete citation details.

Keywords: AI Surveillance, Threat Detection, Computer Vision, Privacy Compliance, Modular Design.

# SMART WASTE MANAGEMENT USING DEEP LEARNING

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Abstract: The swift expansion of urbanization and industrialization has resulted in a concerning rise in waste generation, which presents considerable risks to both the environment and public health. Effective waste management, particularly through the classification of waste, is essential for mitigating these challenges. Conventional waste segregation methods are often manual, labour intensive, and susceptible to human error, thereby necessitating the implementation of automation. This project investigates the application of sophisticated Deep Learning models— including Artificial Neural Networks (ANNs), Convolutional Neural Networks (CNNs), Region-based CNNs (R-CNNs), and YOLOv8—to automate the categorization of waste into types such as biodegradable, non-biodegradable, recyclable, and hazardous. The research utilizes a custom dataset of waste images, which have been pre-augmented and sourced from open-access repositories. These images undergo processing, training, and evaluation across various neural network models. The effectiveness of each model is assessed using critical metrics, including accuracy, precision, recall, F1-score, and mean average precision (mAP@0.5) for object detection methodologies. Additionally, YOLOv8, a cutting-edge real-time object detection framework, is utilized to identify and localize waste items in real-time environments. The models are constructed using PyTorch, OpenCV, and the Ultralytics YOLO library, and are evaluated under a range of conditions, such as varying lighting, cluttered backgrounds, and scenarios involving multiple objects. This report provides a comparative analysis of all models, highlighting their respective advantages and limitations, along with practical suggestions for the implementation of AI driven waste classification systems. The findings not only enhance the automation of waste segregation but also promote environmental sustainability.

Keywords: Waste, Classification, Deep Learning, YOLOv8, Automation

# SPATIAL AI FOR URBAN MOBILITY: INTEGRATING MACHINE LEARNING WITH GEOSPATIAL DATA

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Abstract: This study studies different deep learning methods and machine learning models for traffic prediction. As traffic is increasing in urban areas, to cater to this problem, we explore and compare different machine learning techniques. In this research, we compare two different recurrent neural network (RNN) models—Long Short-Term Memory (LSTM) and Gated Recurrent Unit (GRU)— by using geospatial data we project or estimate traffic over some time. Various preprocessing steps like normalization and differencing are used to ensure all features are on a standard range, preventing features with substantial values from dominating the learning process to improve how well the model predicts compared to actual values and to enhance training speed. When combining LSTM and GRU models to form the ensemble model prediction was enhanced, and calculation of Mean Absolute Error (MAE) and Root Mean Squared Error (RMSE) showed better results rather than when calculated for individual models. Multiple analyses such as graphical and statistical (residual plots, Q-Q plots, and heatmaps) validate that the model achieves its purpose. The findings indicate that hybrid ensemble models greatly enhance forecast reliability, making them ideal for real-time traffic management in smart cities. While there are challenges related to computational costs and fine-tuning hyperparameters, the study highlights the promise of spatial AI and deep learning in improving urban transportation planning and infrastructure. Future research will aim to incorporate a wider range of external datasets to further boost the model's adaptability and accuracy.

Keywords: Traffic Prediction, Deep Learning, RNN, LSTM, GRU, Ensemble Models, Urban Transportation.

# SPEECH-TO-TEXT TRANSCRIPTION MODEL

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Abstract: The Speech-to-Text Transcription Model is an AI-powered system designed to convert human speech into written text with high accuracy. The project leverages cutting-edge deep learning techniques, including transformer-based models such as Whisper and Wav2Vec2, to improve speech recognition in diverse environments. This study aims to enhance speech-to-text accuracy by addressing major challenges, including accent variations, background noise, overlapping speech, and low-quality audio inputs. The methodology incorporates advanced audio preprocessing techniques such as noise suppression, silence removal, and spectrogram analysis to improve input quality before feeding it into the model. Data augmentation strategies, including time-stretching, pitch-shifting, and adding environmental noise, help train a more robust model capable of handling real-world variations. A comparative analysis of different speech recognition architectures, including RNNs, CNNs, and Transformers, was conducted to determine the optimal model structure. Initial experiments with a Recurrent Neural Network (RNN) and Long Short-Term Memory (LSTM) model provided a baseline performance with a Word Error Rate (WER) of 35%. Further refinements using Wav2Vec2, a self- supervised learning approach, and the Whisper model led to significant improvements in transcription accuracy. The model was trained on diverse speech datasets such as LibriSpeech, Common Voice, and TED- LIUM, ensuring adaptability to various accents and speaking styles. The evaluation process employed WER, BLEU score, and Levenshtein distance as key performance metrics. The trained model demonstrated competitive performance against commercial ASR solutions like Google Speech-to-Text and IBM Watson ASR. In addition to accuracy improvements, the project explored deployment strategies, including containerization using Docker and real-time streaming capabilities. The ultimate goal is to integrate this model into applications requiring real-time transcription, voice assistants, and accessibility tools. Future work involves fine-tuning for specific domains, expanding multilingual support, and optimizing inference speed for low-latency deployment. This report provides a detailed overview of the research, methodology, implementation, evaluation, and future scope of the Speech-to-Text Transcription Model.

Keywords: Speech-to-Text, AI, Deep Learning, Whisper, Wav2Vec2, Noise Suppression, Spectrogram Analysis, Data Augmentation, RNN, LSTM, Transformers, Word Error Rate (WER), BLEU Score, Levenshtein Distance, Real-time Transcription

# SPORTS TEAM ANALYZER

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Abstract: Football analytics have transformed player evaluation, strategic decision-making, and recruitment planning. Machine learning has emerged as a vital tool for assessing player performance, particularly in identifying top goal scorers and efficient goalkeepers. This research aims to evaluate the impact of team statistics on goals and saves, analyzing correlations between team attacks, team goals, individual dangerous attacks, and the number of goals scored. Similarly, team goals conceded were examined to correlate with goalkeeper saves. The study predicts the top scorer and best goalkeeper using seven machine learning models: Random Forest, Linear Regression, XGBoost, K-Nearest Neighbor (KNN), Decision Trees, Gradient Boosting, and Support Vector Regression (SVR). Data was gathered through web scraping and API integration from five leagues — Premier League, Serie A, La Liga, Ligue 1, and Bundesliga — covering the 2017/2018 to 2022/2023 seasons. Model performance was evaluated using Mean Squared Error (MSE), Mean Absolute Error (MAE), R-Squared ($R^2$), Root Mean Squared Error (RMSE), and Mean Absolute Percentage Error (MAPE). Results indicate that XGBoost performed best for goal prediction, while Linear Regression excelled in predicting goalkeeper saves, offering valuable insights for enhanced decision-making.

Keywords: Football, Analytics, Machine Learning, Prediction, Goalkeeper

# STORYCRAFT: SHORT STORY GENERATION USING DL

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Abstract: This research paper sheds light on the development of a multimodal story generator known as StoryCraft, that uses advanced deep-learning techniques to produce coherent and engaging narratives from visual inputs according to different genres. Building upon the capabilities of large language models such as the LLaVa model for generating captions from the visual inputs, the GPT2 model for generating small texts from the captions and lastly the LLaMa model for generating contextually and grammatically correct stories from the small texts tailored to various genres including horror, comedy, romance, children's, adventure, mystery and fantasy. The proposed model integrates visual and textual data to increase storytelling quality, overcoming restrictions of existing models that struggle with generating grammatically correct narratives. Apart from overcoming the limits of the previous models it also makes use of transformers rather than the traditional CNN and RNN system leading to the generation of not-so-short stories. The analysis of the generated stories is conducted through an amalgamation of automated metrics, such as ROUGE-L and BLEU scores and human evaluation metric as well, alongside a comparative analysis with different models to prove which model performs better and gives desired output. Results depict that the Storycraft model (LLaMA) outperforms previous state-of-the-art systems, demonstrating valuable enhancements in narrative quality and user satisfaction. Keywords: Story Generation, Deep Learning, Multimodal Models, LLaMA, LLAVA, Genre-Specific Narratives, AI Evaluation Metrics, Coherence and Creativity, Visual Storytelling.

Keywords: Story Generation, Deep Learning, Multimodal Models, LLaMA, LLAVA, Genre-Specific Narratives, AI Evaluation Metrics, Coherence and Creativity,

# STUDENT PERFORMANCE PREDICTOR USING MACHINE LEARNING AND DATA MINING

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Abstract: Abstract—Early identification of student dropout risk is critical for educational institutions to intervene and improve student retention rates. This study introduces an innovative method that combines hybrid deep learning models with gradient boosting techniques to accurately estimate student dropout probability. Our method utilizes deep learning's capacity to identify intricate patterns in data and gradient boosting's efficacy in managing tabular datasets, resulting in reliable predictions derived from diverse student data, encompassing demographic, academic, and financial variables. The dataset include characteristics including age, prior qualifications, academic achievement, and socioeconomic status, all of which influence dropout behavior. Our methodology employs a two-tiered model, wherein a deep neural network initially derives high-level feature representations from the input data. This result is subsequently utilized by a gradient boosting technique to refine predictions. This hybrid method enhances accuracy and aids in identifying the principal variables contributing to student dropout. Experimental findings indicate a considerable enhancement in early detection accuracy relative to conventional machine learning models, positioning this technology as a valuable resource for educational institutions aiming to implement proactive measures to mitigate student dropout. Keywords— Student Dropout Prediction, Hybrid Deep Learning, Gradient Boosting Algorithms, Educational Data Mining, Machine Learning, Academic Performance, Early Warning System, Feature Selection, Risk Prediction Models, Higher Education.

Keywords: Student dropout prediction, Hybrid deep learning, Gradient boosting, Educational data mining, Early warning system

# SUICIDAL DETECTION USING CHATBOT

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Abstract: Suicide is a critical public health issue, affecting millions of individuals globally. Early detection of suicidal ideation is essential for effective intervention and prevention. Traditional risk assessment methods, such as questionnaires and interviews, are often limited by individuals' reluctance to disclose their thoughts and emotions, leading to underreporting and misassessment. With advancements in technology, chatbots utilizing Natural Language Processing (NLP) have emerged as potential tools for detecting suicidal ideation through conversation. This paper presents a comparative study of existing chatbot systems designed for suicide risk detection, focusing on their use of NLP techniques to analyze user input for linguistic markers and patterns associated with suicidal intent. By evaluating and comparing these systems, this study highlights the strengths and limitations of current approaches, offering insights into how chatbot technology can complement traditional methods in suicide prevention. The findings aim to guide future development and optimization of chatbot-based interventions for more effective identification and support of at-risk individuals.

Keywords: Suicide prevention, Natural Language Processing (NLP), Chatbot systems, Suicidal ideation detection, Mental health technology

# SURAKSHA PATH: FIRE EVACUATION AID

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Abstract: Suraksha Path is a fire evacuation device designed to enhance safety by utilizing a network of real-time detection devices. The system employs a flame sensor and MQ2 gas sensors connected to an ESP32 microcontroller to continuously monitor fire and smoke conditions. Upon detecting hazardous situations, the device activates illuminated exit signs and voice alarm systems, providing clear, immediate guidance for individuals, especially those with limited visibility or mobility. Powered by a backup battery, the system ensures uninterrupted operation during emergencies, offering reliable detection and communication for safe evacuation. The mobile application receives real-time data from the central server, which processes information from the sensor. The mobile app dynamically updates safe evacuation routes based on current conditions, offering voice-guided navigation for visually impaired individuals. The real-time route adjustment guarantees that blocked or unsafe paths are avoided, ensuring users are guided safely to the nearest exit. This interaction between the server, sensors, and mobile application prioritizes accessibility and ensures that all individuals, especially those with visual impairments, receive critical guidance during emergencies.

Keywords: Fire Evacuation System, Real-Time Monitoring, ESP32 Microcontroller, Accessibility, Voice-Guided Navigation.

# SYNTHETIC DATA AUGMENTATION FOR EXCEPTIONAL DISEASE USING GENERATIVE ADVERSARIAL NETWORKS

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Abstract: Rare diseases pose significant challenges in medical research due to the scarcity of high-quality medical datasets and patient data, making it difficult to develop accurate diagnostic and predictive models It also has a significant challenge in training robust machine learning models for diagnosing exceptional diseases. By training GANs on existing rare disease datasets, we aim to create synthetic data that mimics real-world distributions, improving machine learning model performance and enabling more reliable rare disease analysis. This project aims to address this limitation by leveraging Generative Adversarial Networks (GANs) to generate high-quality synthetic datasets. A GAN-based framework is developed to generate realistic biomedical voice measurements, preserving statistical properties and correlation structures. The synthetic data is validated using Kolmogorov-Smirnov (KS) tests, correlation analysis, and machine learning performance metrics to ensure fidelity to real-world distributions. Experimental results demonstrate that machine learning models trained on augmented datasets achieve over 95% classification accuracy, surpassing baseline models trained solely on real data. This study highlights the potential of GAN-generated synthetic data in overcoming data limitations in rare diseases, facilitating improved diagnostic accuracy and generalization. The proposed approach can be extended to other biomedical domains, offering a scalable solution for enhancing predictive analytics in healthcare.

Keywords: Rare Diseases, Synthetic Data Generation, Generative Adversarial Networks, Biomedical Voice Analysis, Diagnostic Accuracy.

# THE AI SOFTWARE FOR SPEECH RECOGNITION, MACHINE TRANSLATION FOR DIFFERENT LANGUAGES

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Abstract: The increasing need for cross-cultural communication has led to a surge in developing AI-driven speech recognition and machine translation systems. This study presents a robust AI software solution capable of realtime speech-to-text conversion and translation into multiple languages. Utilizing deep neural networks for speech recognition and Transformer-based architectures for translation, the system achieves high accuracy, contextual awareness, and low latency. Experimental evaluations demonstrate the model's ability to facilitate seamless multilingual conversations, laying the groundwork for breaking language barriers globally.

Keywords: Speech Recognition, Machine Translation, Real-Time AI Systems, Transformer Models, Multilingual Communication.

# THE DOODLE MEISTER

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Abstract: 'Gestura' is an innovative application that merges gesture recognition with rehabilitation, offering an intuitive way to interact with technology. The app features two core functionalities: Air Canvas, which enables users to draw in the air using hand gestures, and Shoulder Rehabilitation Exercises, designed to aid injury recovery through guided physiotherapy. Leveraging Mediapipe, OpenCV, NumPy, and Deque, Gestura precisely tracks hand and shoulder movements, rendering gestures in real-time while providing corrective feedback on motion accuracy. This paper delves into the underlying algorithms for gesture recognition, motion tracking, and real-time rehabilitation feedback, analysing how they enhance user experience. Additionally, we explore the potential for AI-driven improvements, such as adaptive learning models for personalized exercise plans and gesture-based interactions. By integrating technology with creative expression and physical therapy, Gestura offers a novel approach to both digital artistry and rehabilitation sciences. The research highlights its implications in healthcare, accessibility, and human-computer interaction, redefining how individuals engage with motion-based technology.

Keywords: Gesture Recognition, Rehabilitation Technology, Air Canvas, Motion Tracking, AI-driven Rehabilitation

# THE EMOTIONAL LENS: REDEFINING RECOMMENDATIONS THROUGH SENTIMENT ANALYSIS FOR MOVIES

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Abstract: This paper introduces an innovative movie recommendation system named MoodCine, which leverages sentiment analysis through machine learning and natural language processing (NLP) methodologies. The system engages users via a conversational interface to discern their emotional states, thereby facilitating tailored movie recommendations. We utilize various models, including Naive Bayes, Long Short-Term Memory (LSTM), and Bidirectional Encoder Representations from Transformers (BERT), to ensure precise sentiment classification. Furthermore, a hash map architecture is incorporated to enable real-time movie retrieval with a constant-time complexity of O(1). Experimental assessments conducted with the IMDB dataset reveal that BERT outperforms other models, achieving an accuracy rate of 94.1%. These results underscore the promise of emotion-driven recommendation systems in enhancing user engagement and satisfaction, effectively aligning technological innovations with the emotional requirements of users.

Keywords: Sentiment Analysis, Movie Recommendation, BERT, Natural Language Processing, Emotion-Aware Systems.

# TIME SERIES ANALYSIS VIA DEEP LEARNING

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Abstract: This research investigates time series forecasting of stock prices for four companies by employing a Long Short-Term Memory (LSTM) deep learning approach, juxtaposed against traditional methods like ARIMA and GARCH. The goal was to determine if deep learning could surpass conventional techniques in predicting financial data, known for its volatility and non- linear behaviour. Stock price histories were gathered, cleaned, and analysed, with the LSTM model trained to detect intricate patterns and dependencies over time. In parallel, ARIMA and GARCH were applied to assess their effectiveness in trend and volatility modelling. Findings indicated that LSTM delivered superior accuracy in predictions, adeptly handling market complexities, though it demanded more computational effort. This study emphasizes deep learning's promise for financial forecasting, providing valuable insights for market stakeholders. By comparing cutting-edge and established methods, it reveals the significance of leveraging advanced tools to overcome challenges in time series analysis, contributing to more reliable financial decision-making.

Keywords: Time Series Analysis; Deep Learning; Neural Networks; Financial Modelling; GARCH

# TRAFFIC LIGHT VIOLATION AND DETECTION SYSTEM USING ARTIFICIAL INTELLIENCE

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Abstract: Abstract—In busy city environments, traffic violations such as running red lights, speeding, and making unsafe lane changes remain leading causes of road accidents and traffic jams. Existing monitoring methods, which largely depend on manual observation, are often slow, inconsistent, and prone to mistakes. To address these issues, this study presents a smart traffic violation detection system that makes use of artificial intelligence to improve accuracy and efficiency. The system uses YOLOv10 for real-time object detection and leverages Convolutional Neural Networks to accurately recognize vehicle number plates. Trained on the COCO dataset and enhanced through deep learning techniques, the system can efficiently detect traffic violations and identify vehicles even under low lighting or partially obstructed views. The complete process—from frame extraction to object detection, number plate recognition, and OCR—is streamlined for real-time performance. Through both simulation and practical testing, the system demonstrated a high level of accuracy, with precision rates ranging between 85% and 95%. This approach has the potential to greatly support traffic enforcement authorities by automating violation detection, ultimately contributing to safer and more orderly roads in our cities. Index Terms— Computer Vision, Object Detection, Image Classification, Accident prediction, CNN, YOLO, ANPR

Keywords: Computer Vision, Object Detection, Image Classification, Accident prediction, CNN, YOLO, ANPR

# TRI-MODALITY INTEGRATION FOR ALZHEIMER'S DIAGNOSIS: HARMONIZING IMAGING & CLINICAL BIOMARKER MODELS.

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Abstract: Alzheimer's Disease (AD) is a progressive neurodegenerative disorder that impairs cognitive functions, affecting daily living and placing a heavy burden on healthcare systems. Early and accurate diagnosis is essential for timely interventions that may slow disease progression and improve outcomes. Traditional diagnostic methods, often limited to single-modality assessments like clinical evaluations or neuroimaging, may not fully capture AD's complex pathology. Recent advancements suggest that integrating multiple data modalities can offer a more comprehensive understanding of the disease. In this study, we combine structural MRI (sMRI), Diffusion Tensor Imaging (DTI)-derived Fractional Anisotropy (FA), and clinical biomarkers to enhance AD classification accuracy. Since unified datasets across all three modalities are unavailable, we used separate datasets for each. Our findings show that while each modality individually provides useful diagnostic insights, integrating their features into a combined model significantly improves classification performance compared to single-modality approaches. This integrated strategy underscores the promise of multimodal analysis in advancing early detection and more accurate diagnosis of Alzheimer's Disease, offering a meaningful improvement over prior single-modality studies.

Keywords: Alzheimer's Disease, Multimodal Diagnosis, Structural MRI, Diffusion Tensor Imaging, Clinical Biomarkers

# UNDERWATER OBJECT DETECTION USING DEEP LEARNING

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Abstract: Under water object detection, environmental moni- toring, and marine research are all significantly influenced by the ability to detect underwater objects. Nevertheless, the detection of objects in underwater environments is characterised by a variety of unique challenges, including low contrast, light attenuation, scattering, and image distortion. These factors have a substantial impact on the accuracy of detection and the quality of images, rendering conventional methods ineffective. Convolutional Neural Networks (CNNs) and Region-Based CNNs (R-CNN) are two deep learning techniques that have demonstrated remarkable advancements in addressing these challenges. The objective of this project is to create a resilient submerged object detection framework that incorporates advanced deep learning models, including Faster R-CNN, YOLO (You Only Look Once), and enhanced feature extraction methods. Image preprocessing techniques, such as noise reduction and contrast enhancement, will be implemented to improve the accuracy of detection. In order to guarantee the model's ability to identify and classify marine organisms, debris, and man-made structures in real-world scenarios, it will be trained on a vast array of underwater datasets. The proposed framework is anticipated to enhance the ac- curacy of detection and the speed of processing, while simul- taneously ensuring the framework's robustness in challenging underwater environments. Key metrics, including mean Aver- age Precision (mAP) and Frames Per Second (FPS), will be implemented to evaluate performance. The outcomes of this research will contribute to advancements in marine resource management, underwater surveillance, and autonomous under- water exploration. Keywords: Underwater Object Detection, Deep Learning, CNN, Faster R-CNN, YOLO

Keywords: Underwater Object Detection, Deep Learning, CNN, Faster R-CNN, YOLO

# USER AUTHENTICATION USING BLOCKCHAIN

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Abstract: In the evolving landscape of digital security, user authentication remains a pivotal challenge, necessitating solutions that balance security, user convenience, and data privacy. Blockchain technology, renowned for its decentralised and immutable nature, presents a promising avenue for enhancing user authentication mechanisms. This paper explores the integration of blockchain into user authentication processes, highlighting its potential to provide robust security while ensuring user data integrity and privacy. Blockchain-based authentication leverages distributed ledger technology to create a decentralised identity verification system. Unlike traditional centralised systems, blockchain ensures that user credentials are not stored on a single server, thus reducing the risk of data breaches. Each authentication transaction is recorded in an immutable ledger, providing a transparent and tamperproof audit trail. This decentralisation inherently mitigates single points of failure and enhances the resilience of authentication systems against cyber attacks

Keywords: User Authentication, Blockchain, Decentralized Identity, Data Privacy, Cybersecurity.

# UTILIZING LARGE LANGUAGE MODELS FOR ALZHEIMER’S COUNSELING

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Abstract: Alzheimer’s disease poses significant challenges for both patients and caregivers, including cognitive decline and emotional distress. To address these issues, this study presents the development of an AI-based counseling system incorporating emotion detection, memory recall, and personalized responses. The system utilizes NLP techniques and models like ALBERT for emotion detection, achieving an overall accuracy of 88.6%, with the highest detection rates for "Neutral" (92.5%) and "Happy" (91.1%) states. Memory recall performance showed high accuracy for caregiver feedback (91.9%) and previous conversations (88.5%). Speech-to-text accuracy reached 98.3% in quiet environments but declined to 79.8% under noisy outdoor conditions. Implemented using TensorFlow and Hugging Face transformers on Google Colab, the system aims to enhance emotional well-being and patient care continuity while addressing gaps in traditional therapeutic methods. These results demonstrate the potential of AI in improving Alzheimer’s counseling. Index Terms—Alzheimer’s disease, emotion detection, natural language processing, AI counseling, memory recall

Keywords: :Alzheimer’s disease, emotion detection, natural language processing, AI counseling, memory recall

# VERIFYME: AUTOMATING IDENTITY VERIFICATION

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Abstract: Identity verification plays a crucial role in contemporary security frameworks, allowing organizations to authenticate individuals with a high degree of reliability. Conventional methods of verification, including passwords and PINs, possess inherent weaknesses, prompting a transition towards biometric authentication solutions. This project introduces a real-time identity verification system that utilizes artificial intelligence (AI) and machine learning (ML), specifically through facial recognition technology. The system captures a live video stream in which a user presents their photo ID alongside their face. It utilizes Mediapipe for real-time facial detection and DeepFace for facial matching, comparing the image extracted from the ID with the live facial feed of the user. Unlike traditional systems that necessitate database storage or pre-registration, this innovative approach allows for immediate verification without retaining any data, thereby enhancing both privacy and security. This report outlines the design, methodology, and implementation of the system, covering aspects such as face detection, preprocessing, feature extraction, and real-time comparison. The application is developed as a desktop-based solution in Python, featuring a graphical user interface (GUI) created with Tkinter. The results indicate that the model effectively verifies identities with a high level of accuracy, while also addressing challenges related to varying lighting conditions, facial angles, and occlusions. The insights gained from this project contribute to the expanding domain of secure biometric authentication and suggest potential applications in fields such as access control, online identity verification, and fraud prevention. Future enhancements may involve the integration of liveness detection to thwart spoofing attempts and the implementation of multi-modal verification to bolster security. Thorough evaluation of the system demonstrates a high level of accuracy in identity verification, rendering it appropriate for use in secure access control, financial transactions, remote identity verification, and fraud prevention. Nonetheless, issues such as inconsistent lighting, varying image resolutions, and facial obstructions can affect the model's robustness. These challenges can be addressed through enhancements like liveness detection to prevent spoofing attacks and multi-modal authentication to improve security.

Keywords: IdentityVerification, FacialRecognition, DeepFace, Mediapipe, BiometricAuthentication

# VIRTUAL DRESSING ROOM

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Abstract: The digital transformation of the fashion industry has led to innovative solutions that enhance the shopping experience. One such advancement is the Virtual Dressing Room (VDR), which leverages Augmented Reality (AR) and Artificial Intelligence (AI) to enable customers to virtually try on clothing, eliminating the need for physical fitting rooms. This study examines the evolution, functionality, and impact of VDRs on consumer behavior and retail business models. A cloud-based architecture is proposed, integrating computer vision, machine learning, and 3D modeling to provide accurate size recommendations and realistic virtual try-ons. The research follows a mixed-method approach, including user surveys and prototype testing, to evaluate efficiency and user satisfaction. Findings indicate that VDRs enhance customer engagement, reduce return rates, and improve shopping convenience. However, challenges such as privacy concerns, user adoption, and implementation costs remain. This study highlights the transformative potential of VDRs in revolutionizing online and offline retail, paving the way for a more immersive and efficient shopping experience.

Keywords: Virtual Dressing Room, Augmented Reality, Artificial Intelligence, Consumer Behavior, Retail Innovation.

# VISION BASED METHODS USING DEEP LEARNING SUCH AS CNN TO PERFORM TERRAIN RECOGNITION

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Abstract: Terrain recognition refers to the computation-based process of land surface analysis and classification from visual and textural properties. It is one of the challenging tasks that find vast applications in autonomous navigation, environmental monitoring, and disaster management. The present project is concerned with introducing a deep learning-based method integrated with Convolutional Block Attention Module (CBAM), for feature extraction enhancement with spatial and channel-wise attention. The architecture uses convolutional layers to extract features through CBAM blocks, which reveal relevant spatial regions and channels. Then the denser layers classify the data according to its multiclass characteristics. The data was trained on different types of terrain such as grassy, sandy, rocky, and marshy terrains. The findings reveal that the integration of CBAM and CNN enhanced classification accuracy significantly better than baseline models such as VGG16, EfficientNet, and Inception ResNet V2. Loss, accuracy plots, confusion matrices, and AUC curves are employed to confirm the efficiency of the model in recognizing terrain patterns. The findings of the present study highlight the feasibility of attention-based models for identifying real-world terrain recognition problems, demonstrating their potential in enhanced classification of terrain surfaces.

Keywords: terrain-recognition, CBAM, deep-learning, CNN, multiclass-classification

# VISUAL SPEECH REOGNITION USING DEEP LEARNING

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Abstract: Visual speech recognition (lipreading) is a transformative field that enhances communication accessibility for hearing-impaired individuals. This project proposes an efficient framework utilizing the LipNet model, which combines 3D Convolutional Neural Networks (3D CNNs), Bidirectional Long Short-Term Memory (Bi-LSTM) layers, and Connectionist Temporal Classification (CTC) loss for sentence-level lipreading. Unlike earlier models focusing on isolated words, LipNet predicts entire sentences directly from silent video sequences. The model was trained on the GRID Corpus, achieving an impressive 95.2% accuracy, significantly outperforming previous benchmarks and human lipreaders. To further boost accuracy and interpretability, an attention mechanism was incorporated, allowing the model to emphasize critical visual frames. The framework demonstrates strong robustness across varied speakers and environmental conditions, suggesting its practical use in real-time assistive technologies, privacy-preserving communications, and human-computer interactions. The results underline the potential of deep learning techniques in advancing multimodal understanding and bridging communication gaps for diverse applications.

Keywords: Visual Speech Recognition, LipNet, 3D CNN, Bi-LSTM, Attention Mechanism.

# WEALTH WIZARD: YOUR GUIDE TO FINANCIAL LITERACY

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Abstract: In an era where financial decisions significantly influence individuals' lives, financial literacy has become an indispensable skill. Despite its importance, many people lack adequate knowledge of personal financial management, leading to poor savings habits, imprudent investments, and increased vulnerability to debt traps. This paper introduces a web-based financial literacy platform to educate on finance, savings, investments, and debt management through interactive games and comprehensive educational modules. The platform's design is rooted in a conceptual model that explores the relationship between financial well-being, financial self-efficacy, and financial literacy. While financial well-being is an endogenous variable, financial literacy is considered an exogenous variable that may be quantified using concepts like financial awareness, experience, and competence. well-being is an endogenous variable, determined by factors such as emergency financial preparedness, current money management stress, and perceived financial security. The platform aims to enhance users' financial literacy and positively impact their financial self-efficacy, thereby improving their overall financial well-being. This creative strategy equips people with the information and abilities needed to make wise financial decisions, ultimately leading to a society that is more secure and financially literate.

Keywords: Financial Literacy, Financial Well-being, Web-based Platform, Financial Self-efficacy, Interactive Education.

# WOUND IMAGE FORGERY DETECTION USING DEEP LEARNING

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Abstract: Wound image forgery detection is critical in ensuring the integrity of medical images, which are often used in diagnosis and clinical decision-making. This study proposes a novel approach that combines deep learning with Scale Invariant Feature Transform (SIFT) and Dyadic Wavelet Transform (DWT) to detect forged wound images. The primary aim is to develop an effective and reliable method for identifying manipulated medical images.  We first extract distinctive features from both genuine and forged wound images using SIFT, which captures scale-invariant key points. These features are processed using DyWT to enhance multi-scale information. A deep convolutional neural network (CNN) is then employed to classify the images based on these extracted features.  The proposed method significantly improves the accuracy and robustness of wound image forgery detection. It provides a promising solution for medical image forensics, ensuring the integrity of wound images used in clinical practice and legal settings. Future work will focus on optimizing the model for real-time applications.

Keywords: Wound Image Forgery, Deep Learning, SIFT, Dyadic Wavelet Transform, Medical Image Forensics.