NCICST '25

CONFERENCE PROCEEDINGS

March 28th-29th 2025 | Chengannur, Kerala, India

Association with

ALUMNI RELATIONS CELL
COLLEGE OF ENGINEERING CHENGANNUR

IEEE

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National Conference on Intelligent Computing and Secure Technologies

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Date: March 28th–29th, 2025

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INSTITUTION BACKGROUND

The College of Engineering Chengannur, an institution of excellence in the domain of technical education, was established in the year 1993, with a vision to create engineers having the drive, skill, and confidence to become the pioneers of tomorrow. The college functions with the highest order of discipline so that all students are trained to excel in highly professional environments. The college was set up under the auspices of the Institute of Human Resources and Development (IHRD) and is recognized by the All India Council for Technical Education (AICTE), New Delhi. It is affiliated to APJ Abdul Kalam Technological University (KTU).
College offers full time programmes in B.Tech Computer Science and Engineering, B.Tech Electronics and Communication Engineering, B.Tech Electrical and Electronics Engineering, B.Tech Computer Science and Engineering (Artificial Intelligence and Machine Learning) and 2 years Master of Computer Application.

DEPARTMENT OF COMPUTER ENGINEERING

The Department of Computer Engineering at College of Engineering Chengannur (CEC) is one of the pioneering departments of the institution, established with a vision to produce competent and technically skilled professionals in the field of computing and information technology. The department nurtures the professional and ethical development of students, preparing them for leadership roles in academia, industry, and public service. It plays a crucial role in fulfilling the institution's mission to develop engineers capable of addressing real-world problems through innovative technological solutions.

VISION OF THE DEPARTMENT

Emerge as a meritorious centre in computing to mould competent and socially committed professionals.

MISSION OF THE DEPARTMENT

1.Nurture a stimulating environment by means of quality education and state of the art facilities to groom young minds for their professional career, higher education and innovative research.
2. Foster managerial and entrepreneurial skills of students through co-curricular and extra-curricular activities.
3. Facilitate the students to address socially relevant problems with professional ethics and values.

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ALERTGUARD : HELMET

[1] Agnes Jose, [2] Elsa Mariza Benny, [3] Krithika Krishn, [4] Shalat P J, [5] Hrudya K P, [6] Anly Antony,

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Keywords: Smart helmet, obstacle detection, ultrasonic sensors, wearable technology, real-time processing and image recognition.

ABSTRACT

This paper develops the need for an innovative safety solution that is designed towards road accident reduction and increased alertness for scooter riders. Based on the latest IoT technologies, the system provides real-time object detection by ultrasonic sensors located on front, left, and right sides of the helmet. The helmet promptly alarms the rider when there is a moving object near him or her, enhancing situational awareness and reaction time. Furthermore, the helmet is designed with traffic light and signboard recognition capabilities, including visual and auditory alerts. For example, it gives a "yellow" voice alert when approaching a yellow traffic light. This multi-modal alert system ensures that riders receive necessary information in a non-intrusive way, which would lead to better road safety.The helmet is designed to be lightweight and comfortable for daily use. Algorithms for image recognition have been used for traffic signal and signboard detection. The Bluetooth module provides sound alerts through connected earphones. Testing showed that the system has a higher detection accuracy of 95% for obstacles and 92% for traffic lights.

SIGN LANGUAGE DETECTION AND TRANSLATION APPLICATION

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Keywords: Sign Language Detection, Real-time Translation, Hand Tracking Technology, AI-Driven Algorithms, Gesture Recognition.

ABSTRACT

This paper introduces an innovative, user-centric system for real-time sign language detection, integrating advanced hand-tracking technology with AI-driven algorithms to facilitate smooth communication between all the individuals using sign language and those who do not. The system translates sign language into English or other languages in real-time, offering broad language support to make it versatile in global contexts. Designed for high accuracy and adaptability, the system leverages real-time hand movement tracking and is trained on large-scale, diverse datasets to handle various gestures, lighting conditions, and environments effectively. Customizable features allow users to tailor the system to their needs, ensuring that only one participant needs to learn the sign language for effective communication. By providing a scalable, robust solution, this project aims to enhance communication accessibility and bridge language barriers for diverse users and communities.

EXPLORING THE METAVERSE: THE FUSION OF AR, VR, AND AI

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Keywords: Metaverse, Virtual reality, Augmented reality, Natural Language Processing.

ABSTRACT

The Metaverse is a rapidly evolving digital ecosystem that represents the integration of augmented reality (AR), virtual reality (VR), and artificial intelligence (AI). This integration is revolutionizing how users interact with digital environments, creating highly immersive, intelligent, and engaging experiences. AR superimposes digital elements onto the real world, while VR generates completely virtual environments. AI plays a crucial role by optimizing these experiences through intelligent automation, natural language processing, and adaptive learning. The fusion of AR, VR, and AI is transforming industries such as gaming, education, healthcare, and business. In gaming, AI-driven virtual worlds adapt to player behavior, while AR enhances real-world game play. Education benefits from AI-powered VR simulations, allowing students to experience historical events or complex scientific concepts interactively. Healthcare applications range from AR-assisted surgeries to VR-based mental health therapy, supported by AI for personalized treatment plans. Businesses leverage the Metaverse for virtual workspaces, AI-driven customer interactions, and digital commerce, redefining collaboration and engagement.

CLASSROOM ENGAGEMENT TRACKER: RFID AND FACIAL RECOGNITION FOR ENHANCED LEARNING

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Keywords: RFID reader, NFC card, OpenCV, ESP32, YOLOv5, Haar Casacade, DeepFace.

ABSTRACT

The Classroom Engagement Tracker System is an educational technology that assists teachers with management tasks and boost engagement in class by recording attendance and performing behavioral scanning of students. By utilizing RFID technology, each student and teacher is issued an NFC card, allowing quick access to attendance through an RFID reader located at the classroom. After the instructor comes into the classroom, there is a period of two minutes before the system recognizes the students for facial recognition of in-class monitoring to allow students to get organized. In class, the AI-enabled system remains active and can identify movements such as careless actions and mobile phone usage. When instances are detected, they are documented, given a date and time stamp, and sent to the instructor for reporting on the degree of engagement in the classroom. Students are engaged in a wider and faster interaction, through portals designed for attendance and behavior analytics while the teachers and administrators assign classes and take attendance respectively, without being exposed to student's behaviors in detail. In more detail, this prototype helps with proper supervision within the classroom and helps focus attention on active class participation.

GUID: AN AI-POWERED WEB PLATFORM FOR ENHANCED PLACEMENT PREPARATION

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Keywords: Placement preparation, AI-powered learning, Gamification, Personalized education, Web-based platform.

ABSTRACT

In today's competitive job market, students face challenges in preparing effectively for placements. GuiD is a web-based platform that combines structured learning, AI- driven personalization, and gamification to enhance placement preparation. Built on Django with an interactive frontend using HTML, CSS, and JavaScript, GuiD integrates AI-powered tools, including Dr. Frnd AI Chatbot (RAG-based), Professor AI, and Researcher AI, to provide real-time assistance, personalized study recommendations, and adaptive assessments. A deep learning-based recommendation system further refines course suggestions based on user engagement, test performance, and forum activity. Additionally, Gamified Navigation-Preventive Mechanism ensures focus and motivation by awarding XP points, badges, and leaderboard rankings. With features like a structured roadmap, coding practice, industry-relevant courses, a resume builder, and a personalized notification system, GuiD offers a comprehensive, distraction-free learning environment, empowering students to excel in placements.

LEVERAGING OCR FOR HARMFUL INGREDIENT DETECTION

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Keywords: Optical Character Recognition (OCR), Ingredient scanning, Food safety, Health-conscious consumer, Realtime alerts, Nutritional information, Transparency, Database integration, Product evaluation, Unbiased assessments.

ABSTRACT

This work focuses on improving consumer safety by utilizing Optical Character Recognition (OCR) technology to examine food ingredient labels. It addresses the rising health concerns caused by harmful ingredients in food products. Unlike traditional food scanning apps, which may provide biased or incomplete data due to subscription models or affiliations with food companies, this work delivers an unbiased, independent platform that immediately alerts users to harmful substances. By comparing scanned ingredients with a comprehensive database, the technology identifies compounds associated with health risks and offers detailed nutritional information. The application aims to empower individuals with dietary restrictions, allergies, or chronic health conditions by simplifying and facilitating informed food choices. It ensures a transparent, free, and user-friendly experience for all users. The app's effectiveness depends on the clarity of product labels and the strength of its ingredient database, ensuring high accuracy and reliability. This project makes a valuable contribution to the health-conscious consumer market by fulfilling the urgent need for improved food safety tools.

AI BASED LEGAL ADVISOR

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Keywords: Natural Language Processing, Gemini 1.5 Flash model, legal advisor, legal jargon.

ABSTRACT

Access to legal assistance is often made difficult by complex legal contexts, high costs, and the need for an expert in even basic legal matters. To address these challenges, this paper presents an AI-Based Legal Advisor system called Legal AD designed to make legal services more accessible and efficient for common people. The system provides a user-friendly interface that allows individuals to look for legal guidance easily, regardless of their legal expertise. It has secure authentication mechanisms to protect user data while providing more access to stored legal documents and automated petition drafting. At its backend, the system uses the Gemini 1.5 Flash model to power an AI-driven chatbot, giving accurate, contextual responses while simplifying complex legal jargon. Additionally, an automated document drafter generates legal documents using predefined templates, reducing time and effort. A document analyzer improves accessibility by enabling users to upload legal texts and receive simplified explanations and legal implications for better understanding. By aiding in key legal processes, the system reduces the dependency on costly legal consultations for small requests while improving efficiency, accuracy, and affordability. This AI-driven system has the power to change the problem of legal accessibility, making individuals confident to dive into legal matters with knowledge.

VIPANI.IO: A DIGITAL MARKETPLACE FOR LOCAL PRODUCERS AND CONSUMERS

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Keywords: Small-Scale Producers, Digital Marketplaces, Real-Time Communication, Location-Based Filtering, Pre- Ordering

ABSTRACT

This paper introduces a mobile application intended to empower local producers such as farmers and home-based food producers by offering them a direct-to-consumer digital marketplace that simplifies their business processes. Streamlined order management, delivery organization, and safe payment pro- cessing are some of the core platform functionalities, facilitating better access to fresh, locally produced goods and facilitating more convenience for consumers. This platform combines sorted products for easy browsing, order placement, and a robust community-driven ecosystem, facilitating direct communication between buyers and sellers and fostering trust and interaction. In addition, taking these into account, consumers are able to pre- order high-demand or seasonal products in advance, guarantee- ing availability and facilitating producers' inventory management through the pre-order feature. The system is also capable of supporting personalized product suggestions and maximizing user experience by proposing relevant products as a function of browsing and purchasing history. By maximizing operational scalability and flexibility within a microservices architecture, the platform provides efficiency and reliability. This digital market offers the possibility of boosting local economies through support for the growth of businesses among farmers and homemade food providers. Furthermore, this solution also seems to promise environmental and social advantages, such as the potential to lower food waste and increase consumer availability of high- quality local products.

EMPOWERING THE VISUALLY IMPAIRED: A VOICE-BASED EMAIL MANAGEMENT SYSTEM

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Keywords: Speech-to-Text (STT), Text-to-Speech (TTS), User accessibility, Email retrieval, Assistive features, User com- mands, IMAP protocol, SMTP, Voice recognition technology, Cognitive load, Accessibility, User interface, Text summarization, Natural Language Processing (NLP), Gmail API, Google Gemini AI, Optical Character Recognition (OCR), Google Cloud STT and TTS, Flask, React, Node.js.

ABSTRACT

This research is aimed at designing a voice enabled email system that can help the visually impaired in using the email in day to day activities. Conventional email clients are design limited to work on the principle of vision which makes it difficult for the visually impaired to navigate through the composition, sending and receiving of emails. To solve these challenges the proposed system uses STT and TTS services to enable the user to control the email system through voice commands. Also, the system incorporates a text summarizer that extracts the main ideas from long emails using NLP for easier comprehension and to minimize the cognitive load. The approach focuses on enhancing the user accessibility, the user interface and digital inclusion of the visually impaired persons.

ACADEMIA AI: AN AI-BASED APPROACH IN ERP SYSTEMS

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Keywords: ERP, AI, Academia AI, CampusAdmin Pro, Automation, Decision Support, Meta-Human AI, AI Calling, CrewAI Agents, Phidata

ABSTRACT

Enterprise Resource Planning (ERP) systems have evolved significantly, incorporating Artificial Intelligence (AI) to enhance decision-making, automation, and efficiency. This paper presents Academia AI, an AI-driven ERP system tailored for academic institutions. Building upon the capabilities of CampusAdmin Pro, Academia AI integrates intelligent automation for administration, student management, and resource allocation. The system features AI-powered analytics, bulk email tracking, CSV import/export, PDF document processing, AI-driven meta-humans for interactive user engagement, AI calling via Twilio, CrewAI agents for automated task handling, and Phidata for advanced data insights. We discuss the architecture, implementation, experimental evaluation, and advantages of AI integration in ERP systems, along with future directions.

TRACKEX: A COMPREHENSIVE EXPENSE TRACKER WITH STOCK RECOMMENDATIONS AND TAX MANAGEMENT

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Keywords: Budgeting, expense management, tax assess- ment, investment counseling, online payment services, money handling.

ABSTRACT

Since society nowadays is highly influenced by technology, controlling one's personal finances has become one of the key concerns of people willing to enhance their financial state. It is possible to find many digital resources for recording expenses or calculating taxes and even investing. However, the majority of these solutions tend to work separately and as a result, are inefficient and prone to errors. Therefore, the present paper file creates and designs a mobile application with most especially financial management features in one platform. The system proposed will have an expense tracker, an income tax calculator, a payment gateway system and investment advice system. The application also guides its users on how they should invest in relation to their financial data and spending behavior. In addition, an embedded payment system also helps to maintain expense classification and tracking through secure processing of payments made and expenses incurred. This approach identifies the limited focus of existing financial tools, hence seeks to offer an all rounded approach to personal finance management in order to enhance user satisfaction and foster deeper understanding of finances. The integrated system enables efficient management of all financial activities whilst giving the user enhanced control over their spending, tax strategies as well as investment options.

RAPIDHOMEZ: A DUAL-APP SOLUTION FOR EFFICIENT ON-DEMAND HOME SERVICES AND VENDOR CONNECTIVITY

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Keywords: Demand home service, Vendor connectivity, Service provider.

ABSTRACT

In today's digital age, the younger generation in creasingly turns to the internet for solutions to everyday problems, such as home maintenance tasks like fixing broken pipes or electrical faults. Our platform aims to bridge this gap by empowering local vendors with an opportunity to connect directly with customers in need of their services. The project consists of two user-friendly mobile applications, one for the customers and another for service providers, enhancing seamless interaction between them for service-related issues. The principal features of the system include service requests and timely responses from customers and service providers. Users can picture the product-related problem and add a description that instantly notifies the service providers in nearby locations who can offer their services, providing an opportunity for competitive bidding. Moreover, the system includes a rating system for users to review service providers and enhance trust and quality assurance. Timely updates and customer support will be available to improve user experience and satisfaction.

AI HEALTHMATE: AN AI DRIVEN HEALTHCARE APP

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Keywords: Artificial Intelligence, precision medicine, health monitoring ,electronic health records (EHR),preventive care,telemedicine,disease diagnosis

ABSTRACT

Rapid advances in the field of artificial intelligence have led to transformative applications in healthcare, including early disease detection, personalized health management, and telemedicine, among others. This paper describes the development of an intelligent healthcare platform integrating a Support Vector Machine-based machine learning model for predicting diseases like Parkinson's, diabetes, and heart disease. This is supported by a diagnostic module powered by a generative AI that can evaluate patient-reported symptoms for a more comprehensive health checkup. A telemedicine module, which will facilitate real-time video and chat consultations, will be included along with an AI-driven health coach, which provides individualized dietary recommendations based on the health conditions of the individual. Putting it all together means improving early diagnosis, making contacts with doctors more easy, and supporting long-lasting welfare. The platform involves filling the holes within the possibilities of access, particularly in non-accessible remote and underserved communities, which encourages the active user to work toward the assumed responsibility for her health. As such, work on such research strengthens efforts regarding the development of integrated AI-based health systems mainly in the scale-up solution, as it implies today, to modernize some crucial health issues

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SMART EXERCISE ASSISTANT

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Keywords: Pose estimation, Blazepose, Mediapipe

ABSTRACT

Daily exercise is very important for the upkeep of healthy living, yet improper posture in exercising can undermine efficiency and expose one to high risks of injuries, especially in the elderly. Although it is possible to pay for a personal trainer to help correct posture, it is generally expensive and not readily avail- able to many. Existing work has utilized Smart Exercise Assistant systems employing different machine learning methods and pose estimation models like BlazePose. This paper suggests integrating BlazePose to estimate pose in real-time with machine learning models to examine posture during exercises like squats and planks. BlazePose is a real-time mobile-optimized lightweight neural network that can detect 33 body keypoints at more than 30 frames per second. Such systems process video input to infer pose information, measure posture accuracy, and identify errors with pose classification and correction models. As deviations from optimal posture are detected, users are given personalized feedback to enable them to correct their posture, lowering the risk of injury and enhancing workout results. Experiments indicate that the system has a high degree of accuracy in detecting posture errors, which indi- cates that the system has the capacity to improve workout performance and reduce injury risks effectively. This innovation emphasizes the role of AI in making posture correction affordable and more accessible, allowing for safe and effective exercise routines.

A SURVEY OF TECHNOLOGIES FOR ENHANCING ALUMNI-STUDENT-FACULTY NETWORKS

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Keywords: Artificial Intelligence (AI), Machine Learning (ML), Alumni Tracking Systems, Secure Authentication, Natural Language Processing (NLP).

ABSTRACT

A Survey of Technologies for Enhancing Alumni- Student-Faculty Networks presents a comprehensive review of existing research and technologies that contribute to the develop- ment of AI and ML-integrated platforms for connecting alumni, students, and faculty. The reviewed literature encompasses di- verse methodologies and applications, focusing on areas such as alumni tracking systems, secure authentication mechanisms, user- centric design, and real-time communication platforms. Notable advancements include the application of machine learning for data classification, natural language processing (NLP) for intel- ligent interactions, and secure web frameworks for safeguarding sensitive information. Several studies highlight innovative approaches to alumni engagement, such as automated data scrap- ing techniques, AI-driven career recommendation systems, and cross-platform applications for dynamic interactions. Advanced authentication mechanisms like PBKDF2 and role-based access control have been implemented to ensure data privacy and user trust. The integration of scalable architectures, such as modular and cloud-based frameworks, further enhances the adaptability and efficiency of these systems. Despite these advancements, key challenges persist, including maintaining user participation, ensuring data compliance with privacy regulations, and optimizing system performance for large-scale user bases. The surveyed literature emphasizes the importance of user-centric features such as mentorship programs, dynamic event notifications, and personalized job recommendations, which significantly improve platform engagement and utility. This review identifies gaps in the current research, such as the need for improved scalability, more robust data security measures, and enhanced real-time in- teraction features. By synthesizing insights from multiple studies, this paper provides a foundation for the development of more comprehensive and innovative platforms that bridge the gap between alumni, students, and faculty, fostering collaboration, knowledge sharing, and professional growth.

AUTO SPAXE: AN IOT BASED SMART PARKING APPLICATION

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Keywords: Smart Parking, Internet of Things (IoT), Park- ing Management, Sensors, License Plate Recognition, Cloud- Based Systems, Urban Mobility, Real-Time Data, Traffic Congestion, Mobile Applications, Parking Automation, Smart City Solutions.

ABSTRACT

The increasing demand for parking in urban areas has led to congestion, time wastage, and inefficient parking management, particularly in densely populated cities.This project aims to develop an IoT-based Smart Parking System that ad- dresses these challenges by offering a fully automated solution through the integration of IoT devices, mobile applications, and cloud-based services. In this work, we solve the current problem by the implementation of an android application with the on- site deployment of an IoT module. Users can search for nearby parking spaces, reserve multiple slots according to their pref- erence, automatic entry or exit using number plate recognition, detailed view of parking history , and navigate to the selected location.The system consists of four main components: the Super Admin website, Admin website, User mobile application, and IoT- enabled parking management hardware. Also, the application is capable of automatically notifying users of nearby parking locations in real time, users can register and maintain their personal account and can have monthly or yearly subscription for parking.Additionally, for efficient parking management, users will get an alert until the parking of a car is not done within the allotted boundaries and ensuring user friendly parking solution.

MAYA:AN INTELLIGENT IMAGE CLASSIFICATION AND DISTRIBUTION SYSTEM

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Keywords: Face detection, image processing, CNN, GAN, image clustering, LaMa inpainting, FCC

ABSTRACT

Managing images from large-scale events can be a daunting task, often requiring significant manual effort to organize and distribute photographs. Post-event image management requires an automated solution for sorting and reordering event photographs.To address this, we present Maya.io, an intelligent computer vision software, integrating facial recognition, face clustering, image enhancement and image inpainting strategies into a single interactive software.It is designed to learn a target face from a single input image, distinguishing it from a vast collection of multi-person photographs, identifying and retrieving photographs featuring specific individuals.Vector databases are incorporated to achieve faster comparison and retrieval while Generative Adversarial Networks(GAN) and Fast Fourier Convolutions(FCC) enables image enhancement and inpainting tasks, making the system more versatile.

AI-POWERED LEGAL ASSISTANCE - A REVIEW OF CHALLENGES, EXISTING SOLUTIONS, AND FUTURE DIRECTIONS

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Keywords: AI legal chat bot, RAG, federated search.

ABSTRACT

Access to legal services remains a critical challenge due to linguistic barriers, lack of awareness, financial constraints, and complex legal frameworks. Women, in particular, face additional obstacles such as social stigma, confidentiality concerns, and fear of judgment when seeking legal aid. Artificial Intelligence (AI) has emerged as a powerful tool for bridging these gaps, with AI-driven legal chatbots offering instant, cost-effective, and multilingual assistance. However, current legal AI solutions primarily focus on outdated frameworks, lack integration with the recently introduced Bharatiya Nyay Sanhita (BNS), and fail to incorporate robust security and gender-sensitive features. This paper provides a comprehensive review of existing AI-powered legal chatbots, analyzing their capabilities, limitations, and the methodologies they employ. Various approaches such as rule-based systems, machine learning (ML) models, Retrieval-Augmented Generation (RAG), federated search, similarity-based retrieval, and AI-driven feedback mechanisms are examined to understand their effectiveness in providing legal aid. The study highlights the advantages and shortcomings of each methodology, particularly in handling jurisdiction-specific laws, real-time legal updates, and privacy concerns. The findings highlight the gaps in existing AI legal assistants, particularly the lack of BNS integration, security measures, and multilingual support, which future research must address.

GPS BASED TRACKING SYSTEM FOR COLLEGE BUS

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Keywords: GPS based tracking, Real time bus tracking

ABSTRACT

College transportation systems often face inefficien- cies due to the lack of real-time tracking, leading to delays and inconvenience for students and staff. This paper presents Where is My College Bus, a real-time bus tracking system that enhances the efficiency and reliability of campus transportation. The system utilizes GPS technology, cloud computing, and mobile application interfaces to provide accurate bus locations, estimated arrival times, and instant notifications. Additionally, a digital bus pass system is integrated to streamline fare management, enhance security, and provide a seamless fee payment option. The system allows students to pay transportation fees through an in- tegrated online payment gateway, enabling cashless transactions and reducing administrative workload. By implementing this system, campus transportation becomes more reliable, reducing waiting times, improving financial transparency, and enhancing the overall user experience.

MULTI MODEL KIDNEY DISEASE PREDICTION SYSTEM

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Keywords: Kidney Disease Prediction, Convolutional Neu- ral Network (CNN), Multilayer Perceptron (MLP), Deep Learn- ing, Machine Learning, Medical Imaging, Tabular Data, Multi-Modal Integration, Artificial Intelligence (AI).

ABSTRACT

Good health relies on the proper functioning of vital organs, and early detection of kidney disease is crucial for timely treatment. Medical imaging techniques such as ultrasound and CT scans, along with clinical data, help doctors make accurate diagnoses.This combines two powerful approaches: CNNs for analyzing kidney images and MLPs for processing patient data. These models work together to improve prediction accuracy. Performance is measured using accuracy, F1 score, recall, and precision. By integrating medical images with structured data, this method improves early detection, leading to better patient care and health outcomes.

OPTICAL CHARACTER RECOGNITION OF MALAYALAM HANDWRITTEN TEXTS

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Keywords: Optical Character Recognition, Character Recognition, Handwritten Malayalam, CNN, Contour Detection, Text Segmentation.

ABSTRACT

Digitizing handwritten Malayalam texts is a challenging undertaking because of the script's complicated character set, diacritical marks, ligatures, and handwriting style variances. This paper suggests creating an optical character recognition (OCR) system that uses convolutional neural networks (CNNs) for character recognition and is especially made for Malayalam script. To improve the clarity and organization of the input handwritten text, the procedure starts with image preprocessing techniques such text segmentation, binarization, and noise reduction. To increase recognition accuracy, segmentation divides the material into manageable parts, like individual words or letters. A CNN-based model is trained on a large dataset of handwritten Malayalam text to capture the script's unique features and enable accurate classification of characters, even with variations in handwriting styles. The system outputs recognized text in a plain text format, converting handwritten documents into digital Malayalam text efficiently. This research demonstrates the potential of CNN-based deep learning models for handwritten Malayalam text recognition and contributes to the development of robust OCR solutions for complex, language-specific scripts.

AI-DRIVEN PRECISION AGRICULTURE: CROP DETECTION, DISEASE PREDICTION, AND WEATHER FORECASTING WITH AGRIGUARD

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Keywords: component, formatting, style, styling, insert

ABSTRACT

Agriculture is crucial for global food security, but maximum productivity is hampered by challenges such as crop misidentification, plant diseases, and unpredictable weather con- ditions. AgriGuard is an AI-enabled system that helps farmers by integrating crop detection, disease prediction, and weather forecasting for smart decision-making. Random Forest is utilized for crop prediction, and ResNet-50 for plant disease detection. A weather API is also integrated to provide real-time environmental data to enable proactive planning against adverse conditions. The proposed system utilizes image processing techniques for crop and disease detection, and machine learning algorithms trained on diverse datasets to enhance prediction accuracy. Experimental results establish the effectiveness of AgriGuard in promoting precision agriculture by giving authentic recommendations to farmers, resulting in higher crop yield and loss minimization. This work underscores the potential of machine learning, deep learning, and real-time data fusion in optimizing agricultural procedures, enhancing sustainability, and promoting data-driven decision-making in agriculture.

AUTOMATIC LIVE ENGAGEMENT DETECTION OF STUDENTS DURING ONLINE MEETING

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Keywords: Real Time Engagement Detection, CNN, ResNet, SMOTE, EfficientNetB0, Online Learning, Facial Feature Anal- ysis, DAiSEE, Deep Learning, Machine Learning, Real time

ABSTRACT

The rise of online education has created a need for tools that can effectively monitor and enhance student engage- ment during virtual classes. This study focuses on predicting engagement levels using video data from the DAiSEE dataset, which captures students' facial expressions and behaviors. By analyzing these visual cues, the system categorizes engagement into three levels: Engaged High, Engaged Low, and Engaged Not Listening. The primary goal is to provide real-time insights to educators, helping them identify disengaged students and improve the learning experience. The proposed approach integrates deep learning and machine learning techniques. Video frames are preprocessed and passed through a pretrained EfficientNetB0 model for feature extraction, generating a 1280-dimensional feature vector per frame. These extracted features are then fed into a custom neural network, which consists of an input layer, a hidden layer with 1024 units, and an output layer with softmax activation for multi- class classification. To handle class imbalance, SMOTE (Synthetic Minority Over-sampling Technique) is applied. The system is further integrated into a custom meeting platform, allowing for real-time engagement monitoring during online sessions. The model achieved an accuracy of 73.04%, demonstrating its effectiveness in classifying student engagement patterns. The results indicate that this approach can assist educators in tracking attentiveness and addressing disengagement in virtual classrooms. By integrating this system into video conferencing tools, real-time feedback can enhance student interaction and improve learning outcomes. This study underscores the potential of AI-powered engagement detection in transforming online education

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SPACECRAFT POSE ESTIMATOR

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Keywords: Spacecraft Pose Estimation Autonomous Navi- gation Satellite Tracking Synthetic Data Hardware-in-the-Loop (HIL) Deep Learning Space Robotics Satellite Image Processing

ABSTRACT

Autonomous navigation using visual sensors is central to future interstellar exploration operations, such as space logistics and on-orbit maintenance. The current shortage of real-space images with accurate annotations makes it hard to learn and validate machine learning (ML) algorithms for spacecraft pose estimation. SPEED+ was developed to remove this barrier and become one of the most prominent solutions by providing over 60,000 synthetic images and 9,531 hardware-in-the-loop (HIL) images, taken in a well-controlled environment that duplicates the light conditions experienced in space. With the dataset, it is possible to rigorously test ML models under many different visual scenarios, with their poses accurately labeled. Also, SPEED+ that is the basis for the second Satellite Pose Estimation Challenge, which allows researchers to compare and improve their respective AI models. With its innovative approach, SPEED+ makes an impact on the spacecraft pose estimation area. This new technology accelerates the autonomous satellite navigation industry to a new level of reliability and efficiency in future missions.

HOSPITALITY ANALYTICS USING POWER BI

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Keywords: Business Intelligence Power BI Dashboard Rev- enue Management Customer Satisfaction Dynamic Pricing Real- Time Data Visualization Predictive Analytics Hotel Performance Metrics Guest Sentiment Analysis

ABSTRACT

Data-driven decision-making is crucial for improving operational efficiency and profitability in the hospitality industry. Traditional revenue management and customer service models often rely on static pricing and manual data processing which limit the ability to adapt to changing market conditions and customer behavior. The proposed Interactive Hospitality Analytics Dashboard is built using Power BI to provide real-time insights into key performance indicators such as Average Daily Rate (ADR), Revenue Per Available Room (RevPAR), occupancy rates and customer ratings. The system integrates data from reservations, customer feedback and financial records allowing dynamic filtering based on location, time period and room category. The dashboard empowers business managers to optimize pricing strategies, improve customer satisfaction and increase revenue potential. The system has demonstrated significant improvements in pricing accuracy, customer engagement and operational efficiency establishing a new benchmark for data- driven business optimization in the hospitality sector.

A REVIEW ON FOREST FIRE PREDICTION USING MACHINE LEARNING TECHNIQUES

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Keywords: Forest fire, Deep learning, CNN, RNN

ABSTRACT

Accurate forecast techniques are necessary to lessen the impact of wildfires, which pose serious risks to the economy, environment, and public safety. By examining a variety of data sources, including vegetation, weather, and past fire records, recent developments in artificial intelligence (AI) and machine learning (ML) have improved the capacity to predict forest fires. Convolutional neural networks (CNNs) and long short-term memory (LSTM) networks are two deep learning techniques that have shown exceptional efficacy at spotting intricate patterns in temporal and spatial data, hence increasing prediction accuracy. The integration of satellite images and environmental data for real-time risk assessment is highlighted in this review study, which looks at several machine learning and deep learning techniques used in forest fire prediction. Data quality, model generalizability, and computational needs are still issues in spite of these developments. The study offers insights into the possi- bilities of AI-driven systems for more accurate and successful forest fire forecast by going over recent research, approaches, and their limits. strengthening data integration, strengthening model interpretability, and broadening the systems' regional applicability are some future initiatives.

PRESERVING THE CANVAS: INTERACTIVE ADVERSARIAL PROTECTION FOR ARTISTIC STYLE IN NEURAL STYLE TRANSFER

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Keywords: Neural Style Transfer, Adversarial Attacks, Style Protection, LAACA, Image Perturbation, Deep Learning

ABSTRACT

Neural Style Transfer (NST) is a popular technique that blends the content of one image with the style of another. However, this very strength can be exploited to steal an artist's unique style without permission. In this paper, we demonstrate how to integrate the Locally Adaptive Adversarial Color Attack (LAACA) method into an NST pipeline to protect style images by adding subtle perturbations that hinder unauthorized style transfer. Our approach preserves the visual quality of the style image for human viewers while degrading the NST output if someone tries to replicate the style. We evaluate our method using metrics like SSIM, PSNR, and heatmaps, and we provide insights into the trade-offs between protection strength and NST quality. Our results suggest that this approach can serve as an effective, proactive tool for artists to safeguard their creative work.

BLOCKCHAIN-ENABLED POST-DISASTER RELIEF ASSISTANCE: ENHANCING TRANSPARENCY IN RESOURCE AND FUND DONATIONS

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Keywords: Blockchain, Post disaster relief, Chat bot assistance.

ABSTRACT

In disaster-stricken regions, timely and transparent aid distribution is crucial for effective relief efforts. Traditional disaster management systems often suffer from inefficiencies, lack of accountability, and mismanagement due to central- ized control and manual processes. This project presents a Blockchain-Enabled Post-Disaster Relief Assistance System that leverages Ethereum-based smart contracts and decentralized ledger technology to enhance transparency, trust, and efficiency in aid distribution. The system ensures immutable transaction records, automated donation management, and fraud prevention by securely recording financial and resource contributions on the blockchain. The platform consists of a Flutter-based mo- bile app for users and volunteers, while administrators and camp coordinators manage operations through a Django-based web platform. Key functionalities include camp management, volunteer verification, donation tracking, inventory verification, psychologist requests, emergency notifications, and chatbot as- sistance. The blockchain module, implemented using Ganache, Node.js, Truffle, Web3.py, and Solidity smart contracts, ensures secure and verifiable transactions. By incorporating role-based access control, this system fosters trust among donors, victims, and relief agencies, ensuring aid reaches those in need promptly and transparently.
