Deep Hybrid Models for Early Diagnosis of Mental Health Conditions

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Abstract:

Mental health disorders such as stress, anxiety, and depression pose a major challenge to personal well-being and social stability. Conventional diagnostic approaches are time-consuming and lack scalability, while traditional machine learning models fail to effectively capture complex multimodal patterns across facial, speech, and textual data. To address these limitations, this research proposes a **Hybrid Multimodal Transformer CapsNet–GAT (HMT-CG)** framework for the early diagnosis of mental health conditions. The model employs **Capsule Networks (CapsNet)** for facial expression analysis to preserve spatial hierarchies and detect subtle micro-expressions, while **Transformer encoders** are utilized to process textual and speech signals, ensuring superior contextual understanding and long-range dependency handling. Furthermore, a **Graph Attention Network (GAT)-based fusion layer** integrates multimodal features to model cross-domain relationships effectively. To overcome data scarcity, **self-supervised pretraining** on large-scale emotion datasets is incorporated, and **explainable AI techniques** such as attention heatmaps and SHAP values are applied to enhance model transparency and trust.

Experimental results on benchmark multimodal datasets indicate that the proposed **HMT-CG framework** surpasses traditional CNN–BiLSTM models in terms of accuracy, robustness, and interpretability. This study emphasizes the potential of explainable multimodal AI in building reliable, scalable, and interpretable diagnostic systems for early mental health detection and intervention.

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AI-Powered Desktop Assistant

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Abstract:

Voice assistants have become one of the most impactful innovations in human–computer interaction, allowing users to perform various tasks through speech rather than manual input. This research presents the design and development of an **AI-powered Voice Assistant** using Python, inspired by commercial systems such as Amazon Alexa and Google Assistant. Unlike proprietary assistants limited to specific hardware, this system utilizes **open-source Python libraries**, ensuring portability, flexibility, and suitability for academic research and experimentation.

The proposed assistant integrates multiple key modules: **Speech Recognition** for converting user voice commands to text, **pyttsx3** for generating text-to-speech responses, **pywhatkit** for multimedia tasks such as playing YouTube videos, **Wikipedia API** for instant knowledge retrieval, and **PyJokes** for entertainment purposes. Furthermore, the system leverages the **OpenAI API** to generate intelligent, context-aware conversational responses, significantly improving natural interaction.

The assistant can perform a range of real-time operations, including greeting the user, reporting the current time, opening websites and applications, fetching data from online sources, and engaging in meaningful dialogues. The modular architecture supports easy scalability, enabling developers to integrate additional features such as **multi-language support**, **IoT-based smart home control**, and **offline command processing**. Overall, this project showcases how speech recognition, natural language processing, and AI automation can be effectively combined to build a **customizable, intelligent, and user-friendly desktop assistant** for both academic and real-world use cases.

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Enhanced Intrusion Detection System for DDoS Attack through Hyperparameter Tuning

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Abstract:

With the growing sophistication of cyber threats, traditional Intrusion Detection Systems (IDS) often struggle to address the evolving landscape of security attacks, particularly Distributed Denial of Service (DDoS) assaults. To overcome these challenges, this study presents an **Enhanced Intrusion Detection System** that leverages advanced data preprocessing, deep learning, and optimization techniques to improve threat detection accuracy and efficiency. The proposed methodology begins with the **CIC-DDoS 2019 dataset**, which undergoes **Z-Score normalization and scaling** to ensure standardized and balanced data distribution.Subsequently, **Principal Component Analysis (PCA)** is applied for dimensionality reduction, effectively retaining the most informative features while minimizing redundancy. A **Deep Neural Network (DNN)** is then utilized to capture intricate nonlinear relationships within the network traffic data. To further improve model performance, **Particle Swarm Optimization (PSO)** is integrated for **hyperparameter tuning**, enhancing the convergence speed and accuracy of the DNN.This hybrid **DNN–PSO approach** enables efficient classification of network traffic into "Normal" and "Anomalous" categories, achieving significant gains in detection precision and false alarm reduction. The results demonstrate that the optimized IDS offers a proactive and scalable defense mechanism, capable of adapting to evolving attack patterns. By combining **Deep Learning** and **Evolutionary Optimization**, this study contributes a robust framework for securing critical infrastructure and sensitive data from emerging **cyber threats**.

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Contactless Attendance System Using AI and Computer Vision

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Abstract:

In today's fast-evolving academic and professional landscape, automation of routine processes is crucial for improving efficiency and accuracy. Attendance management, a vital administrative task, often suffers from limitations in traditional methods such as manual roll calls or biometric systems, which are time-consuming, error-prone, and less secure. To address these challenges, this research proposes a **Contactless Smart Attendance System** utilizing **Face Recognition Technology** powered by **Artificial Intelligence (AI)** and **Computer Vision**.

The proposed system captures real-time images through a camera and processes them using **Haar Cascade** for face detection and **Local Binary Pattern Histogram (LBPH)** for face recognition. Recognized data is automatically recorded in the attendance database, minimizing human intervention. Cloud integration ensures secure storage, quick retrieval, and real-time monitoring of attendance records. This intelligent system enhances accuracy, prevents proxy attendance, and reduces administrative workload. Its modular architecture enables scalability across educational institutions, corporate sectors, and other organizations. Experimental results demonstrate high recognition accuracy under diverse lighting conditions and facial orientations.

The system supports digital transformation by leveraging AI to streamline attendance tracking. Future improvements include mobile application integration, instant notifications, and the adoption of **deep learning models** such as **Convolutional Neural Networks (CNNs)** for greater precision. Overall, the proposed framework provides a reliable, secure, and efficient solution for automated attendance management using AI and Computer Vision.

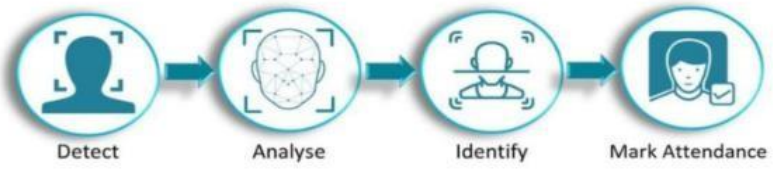

Fig. Process Flow of Face Recognition-Based Attendance

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Detecting Anomalies in Aircraft Using Deep Learning

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Abstract:

In modern aviation, ensuring the safety, reliability, and efficiency of aircraft operations is paramount. Traditional maintenance practices, which rely on scheduled checks and reactive repairs, are often inefficient and may fail to prevent unexpected failures. This research presents a **predictive machine learning approach** for **anomaly detection in aircraft systems** using real-time sensor data and historical maintenance records.

By leveraging both **supervised and unsupervised algorithms**—such as **Isolation Forests**, **Autoencoders**, and **Random Forests**—the proposed system identifies abnormal patterns in critical parameters like engine temperature, vibration, and fuel flow. These anomalies act as early indicators of potential system faults, enabling **proactive maintenance** and minimizing aircraft downtime. The model incorporates **time-series data preprocessing**, **feature engineering**, and **threshold optimization** to enhance detection accuracy.

Experimental results demonstrate the system's ability to detect rare but critical anomalies with **high precision** and **minimal false positives**. The proposed approach provides a **scalable, data-driven solution** for predictive maintenance, ultimately enhancing **flight safety**, **reducing operational costs**, and improving **reliability** in the aviation industry.

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Cybersecurity: Safeguarding the Digital Era

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Abstract:

Cybersecurity has become one of the most critical domains in today's digital era, where nearly every aspect of life relies on technology and the internet. It focuses on **protecting systems, networks, and data** from unauthorized access, attacks, or damage. With the rapid growth of cyber threats such as malware, phishing, ransomware, and data breaches, the need for **robust security measures** has significantly increased.

Cybersecurity safeguards sensitive personal and organizational information while ensuring **trust, privacy, and smooth functioning** of digital services. It involves a combination of **technologies, processes, and practices**, supported by skilled professionals who identify vulnerabilities, prevent attacks, and respond to security incidents. As the world becomes more interconnected through **cloud computing, the Internet of Things (IoT), and artificial intelligence**, the demand for cybersecurity solutions and experts continues to rise.

Thus, cybersecurity plays a **vital role in protecting individuals, businesses, and governments** from the constantly evolving landscape of cyber risks, ensuring a safer and more reliable digital environment.

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Friction Drilling of Corten Steel Plates – A Feasibility Study

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Abstract:

Traditional drilling involves a fluted tool with cutting edges that remove metal in the form of chips, requiring coolant to reduce heat and minimize tool wear. **Friction drilling** is an emerging technique that forms holes using **frictional heat** between the tool and the workpiece, eliminating the need for cutting edges. In this method, the tool shank ends with a shoulder and pin, which softens the workpiece material through frictional heating. As the pin plunges into the workpiece, the material is **plastically extruded**, forming a **bush at the top** and a **bore at the bottom** of the hole.

Corten steel, a type of weathering steel used in Indian Railways for bridges and coach bodies, resists corrosion even under extreme conditions. This experimental study evaluates the feasibility of drilling holes in Corten steel using the friction drilling technique. It was observed that a **high-speed steel friction drill tool** can successfully drill Corten steel at **1000 rpm** with a **feed rate of 60 mm/min**.

The results demonstrate that **friction drilling** is a viable method for creating holes in hard materials like Corten steel, offering a **cost-effective and efficient alternative** to conventional drilling.

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RAG-Based AI Chatbot for Navigating University Curriculum

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Abstract:

To address the challenge students face in navigating scattered and extensive course information, this project presents a **RAG-based AI-powered academic chatbot** for University Curriculum. The system is built on a **Retrieval-Augmented Generation (RAG) framework**, grounding responses in official university documents.

The process begins with creating a knowledge base by extracting data from online syllabi and PDFs using **web scraping and text parsing**. Documents are chunked and converted into **semantic vectors** via a pre-trained embedding model from **Hugging Face**, while a **FAISS vector database** enables fast and efficient retrieval through semantic search. When a student submits a query, the most relevant document excerpts are retrieved and passed to an **open-source language model** from Hugging Face, which synthesizes the context to generate **clear, accurate, and natural language responses**.

The chatbot interface is built with **Streamlit**, providing a lightweight and self-contained application that operates without external API dependencies. This system streamlines access to information on subjects, credit distribution, and curriculum details, demonstrating the integration of **modern AI and NLP techniques** to create a practical and impactful tool that enhances **student self-reliance and academic support**.

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Face Recognition-Driven Student Attendance Monitoring & Course Dashboard Application

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Abstract:

Traditional attendance and course management systems in higher education often suffer from inefficiency, impersonation, and limited automation. Manual roll calls are time-consuming and error-prone, while card or password-based systems remain vulnerable to misuse. Learning Management Systems (LMS) frequently lack robust authentication and seamless integration with attendance records.

This project presents a **Face Recognition-Driven Student Attendance Monitoring and Course Dashboard Application**. The system uses **biometric authentication** to ensure that only registered students gain access. Student faces are scanned in real-time using **OpenCV** and **MediaPipe**, and validated faces trigger automatic retrieval of biodata from the database. Invalid or unrecognized faces are flagged, preventing impersonation. Attendance is automatically recorded upon successful authentication, reducing manual effort and eliminating proxy attendance.

The application also provides a **personalized course dashboard** that displays student details, attendance statistics, and enrolled courses. Progress bars dynamically update as lessons are completed, enabling students to track their academic journey and access course materials beyond classroom sessions. The backend is implemented in **Python**, the frontend in **React.js**, and **MySQL** manages structured data. Real-time recognition is powered by OpenCV and MediaPipe.

By combining **security, automation, and accessibility**, this solution enhances operational efficiency, strengthens institutional transparency, and improves student engagement in colleges and universities.

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QR Code Malicious URL Detection System Using Machine Learning

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Abstract:

The rapid rise of **QR Codes** in payments, advertising, and authentication has introduced significant cybersecurity risks, as attackers increasingly embed **malicious URLs** to compromise devices and steal sensitive information. To address this challenge, this project proposes a **QR Code Malicious URL Detection System** leveraging advanced **machine learning models** for improved accuracy and adaptability.

Four algorithms are employed: **Passive-Aggressive Algorithm, Quadratic Discriminant Analysis (QDA), Ridge Classifier,** and **Extra Trees Classifier**, which can operate individually or in combination to enhance detection performance. By integrating **QR Code-specific analysis** with robust machine learning techniques, the system can effectively identify potentially harmful URLs, providing a scalable, adaptive, and reliable solution for modern cybersecurity threats.

This framework ensures **proactive detection** of malicious QR codes, safeguarding users from evolving digital threats and reinforcing trust in QR-based applications.

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Real-Time Monitoring of Driver Drowsiness and Distraction Detection

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Abstract:

Driver fatigue and distraction are major contributors to road accidents worldwide. This project presents a **real-time driver monitoring system** that employs **computer vision and machine learning** techniques to detect drowsiness and inattentiveness. The system uses **facial landmark detection** to monitor eye closure and facial orientation, leveraging the **Dlib library** for accurate face and landmark identification. Video is captured from the default camera, and the **Eye Aspect Ratio (EAR)** is calculated to determine eye status.

When the EAR falls below a threshold for a sustained duration, an **audio alert** is triggered, signaling potential fatigue. The system also detects prolonged absence of the driver's face, indicating distraction, and issues an alert. Additionally, a **Convolutional Neural Network (CNN)** is implemented for gender classification, providing contextual information about the driver. This intelligent monitoring framework enables proactive intervention, enhancing road safety by alerting drivers before fatigue or distraction leads to accidents.

The system's modular architecture allows easy integration into vehicles, providing scalable and real-time detection to improve driver safety.

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Smart Adaptive Traffic Signal with Emergency and Pedestrian Priority

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Abstract:

Traditional fixed-time traffic signals often fail to adapt to dynamic urban traffic, resulting in congestion and delayed emergency response. This research proposes a **Smart Adaptive Traffic Signal System** with emergency and pedestrian priority, utilizing a **three-tier IoT-enabled architecture**. The Sensing Layer employs the **YOLOv5 deep learning model** on an edge processing unit to detect real-time vehicle queues and identify priority events such as emergency vehicles. This data is transmitted to the Control Layer, based on an **ESP32 microcontroller**, which executes **Hierarchical Control Logic**: Tier 1 (Preemption Logic) immediately grants right-of-way to critical vehicles, while Tier 2 (Adaptive Scheduling) employs a **Priority Queue Scheduling Algorithm (PQSA)** to select the busiest lane.

The **Dynamic Time Scaling Algorithm (DTSA)** calculates green light duration proportionally to the detected vehicle queue, maximizing traffic flow. Inter-lane IoT communication enables network-wide coordination. **Simulation results** demonstrate a 55.4% reduction in Average Vehicle Waiting Time (AVWT) and a 20% increase in total throughput compared to fixed-time systems under high-demand conditions. This intelligent traffic management approach enhances urban mobility, reduces delays, and improves emergency response efficiency.

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Covert Channel Communication and Detection in ICMP Protocol

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Abstract:

Securing modern networks requires detecting both overt attacks and hidden communication channels embedded within legitimate protocols. The **Internet Control Message Protocol (ICMP)**, widely used for diagnostics such as ping and error reporting, has been exploited to establish covert channels for command-and-control and data exfiltration. These channels are difficult to detect using rule-based systems due to their similarity to normal traffic.

This project proposes a **machine learning-based detection system** for covert communication in ICMP traffic. A dataset of ICMP packets was generated, including normal and covert traffic, with features such as Time to Live, packet size, payload length, inter-arrival timing, and ASCII content ratio. Five machine learning algorithms—**Decision Tree, Random Forest, Logistic Regression, Support Vector Machine, and XGBoost**—were trained and evaluated. Among these, Random Forest achieved the highest accuracy of 98%.

The trained model was integrated into a **real-time detection system** that captures ICMP packets, extracts features, and dynamically classifies them. Covert communications trigger immediate alerts, while normal traffic is passed as safe. Experimental results demonstrate that machine learning improves detection accuracy compared to rule-based approaches and provides resilience against timing-based covert channels. This system strengthens network security by preventing ICMP misuse as a covert communication channel.

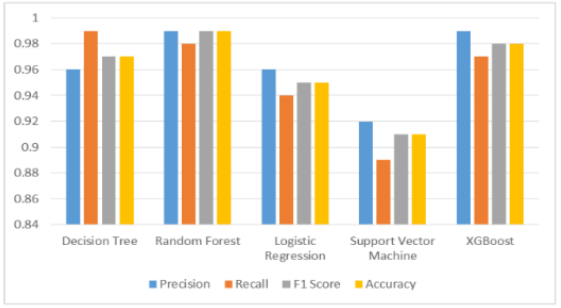

Fig. Performance comparison of ML algorithms for ICMP covert channel detection

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Fortilock: Integrating Public Key Encryption with OTP-Based MFA for Robust Security

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Abstract:

With the rapid growth of online platforms, financial services, and digital communication, protecting sensitive information has become a top priority. Traditional security methods, such as passwords alone, are increasingly inadequate against modern cyberattacks. Hackers can steal or guess passwords, leaving critical systems vulnerable.

This project introduces **Fortilock**, a multi-layered security framework that combines **public key encryption** with **OTP-based multi-factor authentication (MFA)** for enhanced protection. Public key encryption ensures that each user has a pair of digital keys—one to encrypt data and another to decrypt it—making intercepted data unreadable without the private key. OTPs add a second layer of security by generating unique, time-sensitive codes for each login attempt, preventing unauthorized access even if passwords are compromised.

Fortilock further integrates **blockchain technology**, providing an immutable ledger of transactions and identities, while smart contracts automate security policies. Artificial intelligence monitors blockchain activity in real time to detect anomalous or suspicious behaviors.

Simulation tests, including login attempts, encryption/decryption of messages, and OTP verification, demonstrate that Fortilock provides a **secure, scalable, and reliable solution** suitable for banking, healthcare, e-commerce, and government applications. By combining encryption, OTPs, blockchain, and AI, Fortilock offers a **human-centered yet highly secure approach** for building digital trust in today's connected world.

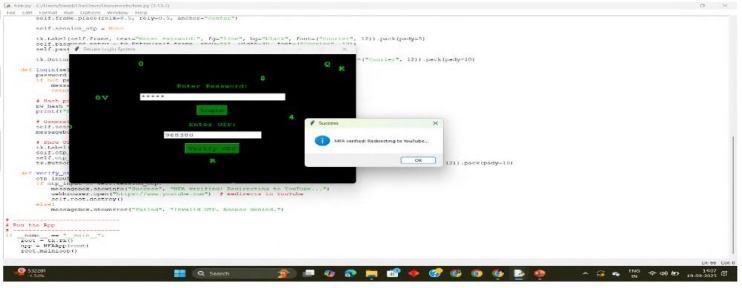

Fig. Fortilock Output

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Survey of Explainable Machine Learning for Suicidal Ideation Detection: From Patient Text to Clinician Trust

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Abstract:

Suicidal ideation (SI) detection from patient text is a critical clinical challenge where automated screening can enable timely support and intervention. Advances in natural language processing (NLP) and machine learning (ML) have significantly improved predictive performance on curated datasets. However, clinical adoption requires **trustworthy and interpretable explanations** that mental health professionals can understand and act upon.

This survey reviews recent literature and methodologies relevant to a clinician–patient application under development, in which daily patient self-reports are analyzed using **ensemble ML models** built on **sentence-transformer embeddings**, complemented by **explainability frameworks**. We evaluate various data sources, including social media content, clinical notes, and benchmark datasets, and compare modeling approaches ranging from traditional classifiers to transformer-based architectures and hybrid ensembles.

For explainability, we focus on **LIME**, **SHAP**, and **Anchors**—techniques that offer local, global, and rule-based interpretability, respectively. Furthermore, the integration of **large language models (LLMs)** is explored to convert technical explanations into concise, evidence-based narratives that enhance clinician understanding and trust.

Our analysis underscores the importance of **multi-method explainable AI (XAI)** pipelines and **human-centered explanation generation** for effective mental health applications. Finally, we highlight existing research gaps, including limited use of multi-faceted XAI and insufficient natural language explanations within current SI detection systems.

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Smart Self-Checkout Cart using IOT based Scanner

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Abstract:

In modern retail environments, long lines at checkout counters are still a common problem. They cause delays and lower customer satisfaction. This project is an IoT-based Smart Shopping Cart system that uses a barcode scanner to automate the billing process in supermarkets and retail stores. The system integrates scanners and sensors to facilitate real-time scanning, automated billing and eliminates queuing time, hence enhancing the customer experience. Each product in the store has a standard barcode (QR code). The cart includes a barcode scanner module connected to an ESP32 microcontroller. When a customer scans an item before placing it in the cart, the scanner reads the barcode, and product details like name and price are shown from the shop's server. The system connects to Wi-Fi to sync data with a central store server and creates a QR code bill for online payments. This project enhances the shopping experience by cutting down checkout time, reducing errors in billing, and providing a smoother retail automation experience.

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Grabez – A Visual Flow-Based Builder for Intelligent Systems and Learning Pipelines

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Abstract:

Nobody drops hard-coding in the industry today. Applying AI assistants and tools to finish our code, projects and tasks is the reality of today's tech world. This dancing method is referred to as the Vibe Code. This is what vibe coding is all about and it does focus on program synthesis, which enables the construction of algorithms, models for learning and applications without having to write programs from scratch. Agents, chatbots, models etc. are made by simply dragging the blocks and connecting them to each other; and you can even see their code and change it (and download the wireframe) or use it as a template for your own project.

In this lesson, you are going to play around a playground built with ReactFlow and add or drop different blocks of code for specific tasks (AI/ML apps) like building a house step-by-step. The main purpose of this project is to be a tool for students and researchers to learn with ease about the flow of models, algorithms, and applications both visually and technically. This application is extended to support next-level advanced tasks which may involve deep learning or pipeline operations and also provides an extension that allows users to make use of it in any IDE they are comfortable with.

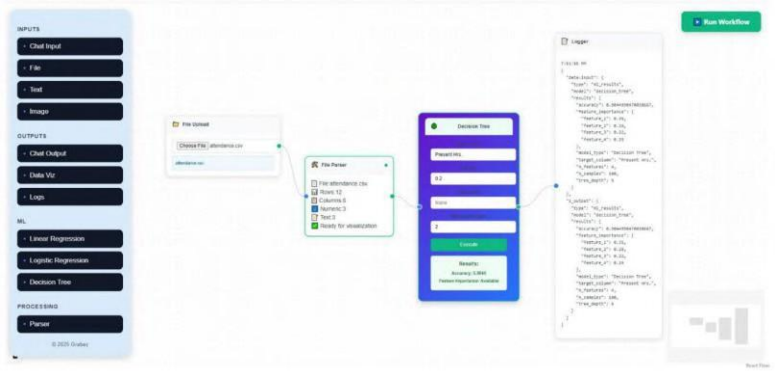

Fig. Application interface

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Healing in Flight: Vein-Like Systems for Aircraft Structural Integrity

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Abstract:

Aircraft structural safety is continually threatened by fatigue cracks that grow silently under repeated stress cycles and sudden fractures caused by impacts. Historic cases, such as the de Havilland Comet accidents of the 1950s and more recent fuselage ruptures in commercial airliners, underscore the catastrophic risks of undetected micro-damage. Modern aircraft increasingly use fibre and forced composites for their high strength-to-weight ratio and improved fatigue performance.

However, cyclic loading can still cause microcracks, delamination, and fibre-matrix debonding in composites. This paper presents a study on the use of self-healing material in fiber-reinforced composites using the method of vascular network embedding and microcapsule-based systems. These methods enhance structural integrity and delay crack propagation under repeated loading. By combining fatigue-resistant composites with a self-healing mechanism, modern aircraft structures can achieve higher safety and extended service life. This integration of historical lessons with cutting-edge material research presents a significant advancement in aerospace structural design.

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AI-Based Detection of Voice Deepfakes Using Spectrogram Analysis and Deep Learning Models

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Abstract:

The rapid growth of generative artificial intelligence has enabled the creation of highly realistic synthetic voices, or audio deepfakes. While image and video deepfakes have been extensively studied, voice deepfakes remain underexplored despite their rising use in fraud, impersonation, and misinformation. This work proposes an AI-based detection framework that distinguishes between genuine human speech and AI-generated voices, thereby enhancing digital trust and preventing misuse.

The methodology involves converting real and synthetic audio samples from benchmark datasets such as ASVspoof into spectrograms to capture time–frequency patterns. These spectrograms are analyzed using deep learning models, including Convolutional Neural Networks (CNNs) to extract spatial features and Long Short-Term Memory (LSTM) networks to capture temporal dependencies. A hybrid CNN–LSTM architecture is employed to leverage both spatial and temporal cues, while an ensemble strategy is introduced to improve generalization across diverse synthetic audio. Performance is evaluated based on accuracy, robustness to unseen generative models, and computational efficiency, with emphasis on enabling real-time deployment in applications such as banking, telecommunications, and social media verification.

Preliminary findings indicate that spectrogram-based deep learning approaches achieve strong detection accuracy and demonstrate promise in identifying AI-generated audio. However, challenges remain in terms of dataset diversity and the need to adapt detection models against rapidly evolving voice synthesis methods.

The relevance of this research lies in addressing a growing cybersecurity risk, offering a scalable and practical solution for detecting voice deepfakes, and contributing to the development of secure and trustworthy AI-driven systems.

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Animated AI Teacher: An Intelligent Avatar-Based Pedagogical Framework for Remote and Hybrid Learning

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Abstract:

The COVID-19 pandemic exposed the limitations of conventional e-learning platforms such as Zoom, Google Meet, and mainstream EdTech applications, which often replicate traditional classrooms online without addressing critical issues such as engagement, personalization, and accountability. This paper proposes the design of an Animated AI Teacher, a next-generation pedagogical framework where an AI-driven avatar functions as a fully autonomous digital teacher capable of delivering lessons, interacting with students, assigning and tracking homework, and adapting to individual learning needs.

The system integrates Artificial Intelligence (AI), Natural Language Processing (NLP), speech synthesis, computer vision, and avatar animation to create an interactive and human-like learning environment. Core components include AI-driven instructional delivery with 2D/3D avatar-based explanations; NLP-enabled conversational interaction for real-time Q&A and personalized clarifications; homework automation and progress tracking powered by smart contracts and rule-based engines; adaptive pedagogy through knowledge-tracing and machine learning algorithms; and gamification features such as badges, leaderboards, and reminders to sustain motivation.

Unlike existing EdTech platforms such as Byju's, Khan Academy, or Squirrel AI, which primarily provide static video lessons or text-based AI tutors, this framework introduces a holistic digital teacher that combines animated instruction, interactive dialogue, and automated assessment into a unified platform. Designed for deployment across web and mobile devices with cloud/edge scalability, the system ensures cost-effective adoption in resource-constrained regions. The expected outcome is a transformative remote learning ecosystem that addresses teacher shortages, enhances student engagement, and ensures accountability in learning outcomes, while aligning with the Sustainable Development Goals (SDGs) and India's National Education Policy (NEP 2020).

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Cloud Integrated Iot Traffic Data Streaming System

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Abstract:

Traffic congestion is a major challenge in modern cities. Traditional traffic monitoring systems rely on static sensors and offline analysis, leading to delayed responses and inefficient route planning. This project proposes a Cloud Integrated IoT Traffic Data Streaming System for real-time traffic monitoring and visualization. The system uses IoT sensors to collect traffic parameters such as vehicle count, speed, and GPS location. Data is streamed through **Apache Kafka** for high throughput, while **Streamlit** and **Folium** enable interactive dashboard visualization. Cloud deployment ensures scalability and accessibility. A prototype demonstrates data simulation, ingestion, and live visualization. The system shows potential for integrating IoT, big data, and cloud platforms to improve traffic management and reduce congestion in smart cities.

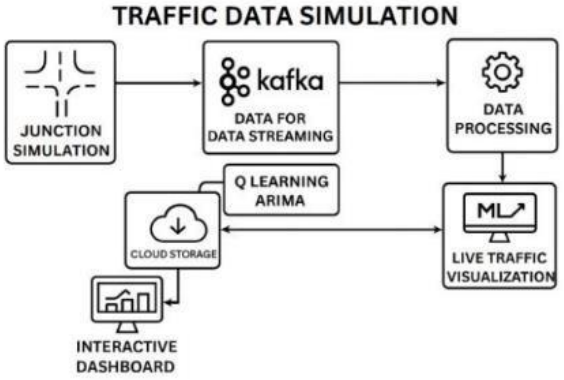

Fig. Architecture Diagram

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Intelligent PPE Detection and Compliance Assurance at Construction Sites Using Improved YOLO Algorithm

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Abstract:

The project focuses on developing an intelligent system for detecting Personal Protective Equipment (PPE) compliance at construction sites using the YOLOv11 algorithm. The system captures real-time video of workers and identifies PPE items such as helmets, safety vests, gloves, and goggles. Non-compliance is flagged instantly through alerts to site supervisors. This automated approach improves workplace safety, reduces accidents due to PPE negligence, and ensures regulatory compliance by continuously monitoring construction personnel.

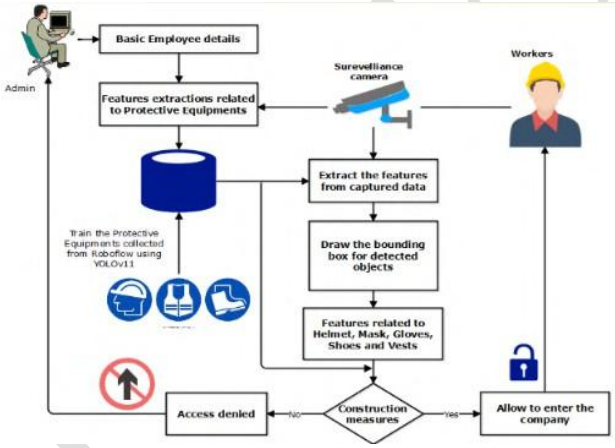

Fig. Architecture Diagram

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Leveraging Deep Learning for Predictive Modeling in Clinical Research and Pharmaceutical Discovery

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Abstract:

The traditional drug discovery process is notoriously slow, expensive, and inefficient, with nearly 90% of candidates failing after entering Phase-I clinical trials. This study explores how deep learning (DL) frameworks offer transformative solutions to accelerate clinical research and pharmaceutical discovery. By leveraging DL models on complex, high-dimensional data—such as genomic sequences, molecular structures, and electronic health records—critical patterns can be identified that traditional methods may miss. The system enables improved target identification, virtual screening optimization, disease diagnosis, and toxicity prediction, thereby reducing risk and shortening development timelines. Integration of these advanced computational tools promotes data-driven, personalized healthcare and enhances the probability of success in therapeutic pipelines.

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Analysis of Emotion Detection based on EEG Signal: Techniques, Framework, and Perspectives on Arousal and Valence Dimensions

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Abstract:

The main motivation of emotion detection lies in its significant impact on the medical field, particularly in analyzing stress, anxiety, and depression disorders, as well as in neuroimaging systems and human–computer interaction (HCI). Electroencephalogram (EEG), one of the key physiological signals, measures brain activity through electrodes placed on the scalp, providing direct insight into the human central nervous system (CNS) and its relation to emotions. This paper presents an in-depth investigation of various EEG-based emotion detection techniques, including preprocessing, data acquisition, feature extraction, and selection methods. It also reviews emotion induction approaches, summarizes commonly used models in literature, and highlights deep learning architectures that have attracted researchers' attention. Furthermore, it discusses existing challenges, emerging research pathways, and the evolving landscape of emotion recognition using physiological signals like EEG. The primary objective is to assist researchers, particularly beginners, in gaining a comprehensive understanding of the techniques and trends shaping the domain of emotion detection in artificial intelligence.

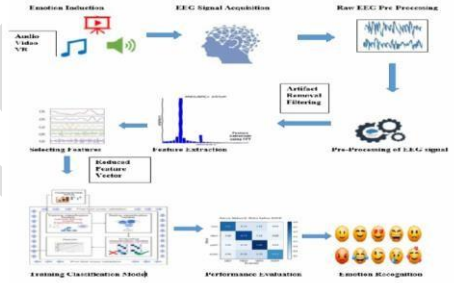

Fig. 1. Complete steps of learning models for emotion recognition

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Design and Fabrication of a Hybrid Savonius-Darrieus Vertical Axis Wind Turbine for Efficient Low-Speed Wind Energy Harvesting: A Comprehensive Review

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Abstract:

This project presents the design and fabrication of a hybrid vertical axis wind turbine (VAWT) that integrates Savonius and Darrieus rotor configurations to achieve efficient energy harvesting at low wind speeds. The Savonius rotor provides strong self-starting capability by utilizing drag forces, while the Darrieus rotor contributes higher rotational speeds through aerodynamic lift. The turbine structure is constructed using L-angle supports and sheet metal blades, with a central shaft supported by bearings. A spur gear mechanism increases the rotational speed transmitted to a DC dynamo, powering a small DC LED light as a proof of concept. The hybrid configuration ensures reliable startup in low wind conditions and stable power generation under variable wind speeds. Experimental demonstration validates the effectiveness of the system, highlighting its potential as a cost-effective small-scale renewable energy solution.

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Aircraft Vibration and Fatigue Monitoring System

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Abstract:

The goal of this project, "ESP32 Aircraft Vibration and Fatigue Monitoring System," is to use accelerometers and an ESP32 microcontroller to identify early indicators of structural stress in airplanes. The system evaluates vibration data, detects potential fatigue issues, and transmits information for remote monitoring using the ESP32's computing power and wireless communication capabilities. The Aircraft Vibration and Fatigue Monitoring System integrates real-time sensor collection from in-service aircraft, vibration measurements, and fatigue predictions to enhance structural integrity monitoring and life-cycle management. Embedded sensor networks, including fiber-optic Bragg grating (FBG) sensors, accelerometers, strain gauges, and piezoelectric devices, monitor vital structural responses during flight. Modal analysis in both time and frequency domains is employed to identify resonant modes and patterns of structural deformation from vibration signals.

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Agriculture Portal: ML & API Solutions for Farmers

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Abstract:

The Agriculture Portal is a comprehensive digital solution for farmers, combining machine learning algorithms and modern APIs to deliver actionable insights and intelligent support. The platform provides region-specific crop and fertilizer recommendations, yield and rainfall predictions, and real-time weather and market data through integrated APIs. Key features include automated trading between farmers and customers, secure online payments, AI chatbot-based assistance, and a dynamic news feed.

Robust models such as Decision Tree, Random Forest, and KNN are trained on localized datasets to maximize prediction accuracy and relevancy. The portal also supports advanced functionalities like soil health analysis, targeted notifications, and data-driven resource optimization. Integration with IoT devices enables real-time monitoring of soil moisture, pH, and nutrient levels, allowing precise field management. Its modular architecture allows easy addition of new services and ensures adaptability to diverse geographic regions and crop types.

Features such as multilingual support and automated updates expand accessibility, while backend flexibility ensures scalability for future technology advancements including deep learning, remote sensing, and expanded API integrations. By delivering reliable recommendations, facilitating efficient crop trading, enabling secure transactions, and providing constant updates, the portal empowers farmers, customers, agribusinesses, and researchers to operate with greater productivity, sustainability, and resilience against market and climate uncertainties.

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Cybersecurity Enhancement Using Honeypots as a Deceptive Defense Mechanism

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Abstract:

In an era of increasing cyberattacks, honeypots provide a proactive defense strategy by luring attackers into simulated environments to study their behavior and strengthen real network security. This project focuses on deploying the T-Pot Honeypot Framework, an open-source, multi-container system integrating over 25 honeypots, intrusion detection and prevention systems (IDS/IPS), and visualization tools.

The honeypot is hosted in a Demilitarized Zone (DMZ) to safely attract malicious actors while maintaining isolation from production networks. Data collected over several weeks include attacker IPs, Autonomous System Numbers (ASNs), attempted credentials, exploited vulnerabilities, and executed commands. The Cowrie SSH honeypot recorded the highest attack frequency, with login attempts using weak credentials such as root–12345 and admin–password. Analysis through the Kibana Dashboard revealed that most attacks originated from IPs linked to VPS providers like Digital Ocean and from regions including the United States, China, and Russia. IDS alerts generated by Suricata identified several high-severity vulnerabilities, including CVE-2019-0708 (BlueKeep) and CVE-2019-12263 (TCP Buffer Overflow), offering critical insights into attacker methods and targets.

This research demonstrates that deceptive honeypot systems not only collect valuable threat intelligence but also strengthen organizational defenses by identifying and mitigating emerging attack patterns. Future work aims to integrate AI-driven anomaly detection, threat prediction models, and automated mitigation mechanisms, enabling a smart, adaptive cybersecurity environment capable of anticipating and neutralizing sophisticated attacks in real time.

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Smart Solar Powered Water Purification and Distribution System in Remote Areas

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Abstract:

Access to clean drinking water remains a major challenge in remote and rural areas, where infrastructure and energy resources are limited. This project presents a **Smart Solar Powered Water Purification and Distribution System** designed to provide an efficient, sustainable, and automated solution for such regions. The system harnesses solar energy to power a water purification unit that utilizes a combination of filtration, ultraviolet (UV) treatment, and reverse osmosis (RO) technologies to ensure safe and potable water. A microcontroller-based automation module monitors water quality parameters such as pH, turbidity, and Total Dissolved Solids (TDS) using IoT-enabled sensors. The purified water is then distributed through a smart valve-controlled network that operates based on real-time demand and storage levels. Data from sensors are transmitted to a cloud-based dashboard, allowing remote monitoring, maintenance alerts, and efficient water management. This eco-friendly system minimizes dependency on grid electricity, reduces human intervention, and ensures a continuous supply of clean water even in power-deficient areas. The proposed model aims to contribute toward sustainable rural development, aligning with global clean water and renewable energy initiatives.

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Design and Implementation of Solar-Powered IoT Integrated Dewatering System for Mining Operation

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Abstract:

Mining operations often face challenges in removing underground water, which traditionally relies on diesel or electric pumps. These methods are costly, environmentally unfriendly, and pose safety risks. This project proposes a solar-powered IoT-integrated dewatering system to address these challenges.

The system consists of high-efficiency solar panels, battery backup, an ADC-to-DC buck converter, and an MPPT charge controller to regulate power. An ESP32 microcontroller manages water level sensors, current sensors, and monitors faults, while a relay automates the pump operation. Real-time data is transmitted to a cloud platform for monitoring, analytics, and predictive maintenance.

By adopting an OPEX model with vendor-managed operation and maintenance, the solution reduces financial burden and ensures cost efficiency. Expected outcomes include up to 90% reduction in operating costs, elimination of diesel dependency, and significant reduction in emissions. The system is scalable across multiple mining shafts, providing a replicable and sustainable solution for the mining industry.

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Digital Code Lock with Alarm, Reset Pin, and Indicators

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Abstract:

Security has become an essential aspect of both personal and organizational safety. Traditional mechanical locks, although widely used, suffer from vulnerabilities such as key duplication, physical tampering, and limited access control. This project presents the design and implementation of a **digital code lock system** equipped with an **alarm, reset pin, and status indicators** to provide enhanced protection and ease of management.

The system employs a programmable microcontroller (e.g., Arduino or 8051) and a keypad interface to authenticate users through a predefined access code. Upon multiple invalid code entries, the alarm is automatically triggered, serving as an immediate deterrent to unauthorized access. The inclusion of a reset pin enables system administrators to restore functionality after lockout conditions without reprogramming, ensuring flexibility and usability.

This design provides modular scalability, allowing integration of advanced security features such as wireless control, biometric authentication, or IoT-based monitoring. By combining programmable logic with real-time feedback and alarm mechanisms, the digital code lock system ensures a **cost-effective, reliable, and modern security solution** suitable for residential, institutional, and industrial applications.

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IoT-Enabled Segregation System for Low- and High-Toxic Particulate Matter and Monitoring

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Abstract:

Globally, particulate matter (PM) collection can be divided into 70% from industrial sources, 28% from urban areas, and 2% from households. This project focuses on the urban share, which we consider as 100% for our calculations. Within this segment, about 10% of PM is toxic, and 90% is non-toxic.

Collecting PM in urban areas typically results in a mix of toxic and non-toxic materials. This mixture makes disposal difficult and expensive, with no chance for recycling. The need for consistent safety measures across the entire batch raises disposal costs, while high toxicity levels make recycling impractical.

To tackle these problems, the project proposes an IoT-enabled system for sorting and monitoring PM based on toxicity and acidity. It uses an MQ135 gas sensor linked to an Arduino Uno, along with a dual fan-filter setup. The system detects low- and high-acidic toxic PM through pH measurements. Fan 1 turns on when low-acidic PM is present at low concentrations and stays off when high-acidic PM is detected at low levels. Fan 2 runs for high-acidic PM at any concentration or for high amounts of low-acidic PM. This selective control helps separate different toxicity levels and reduces cross-contamination.

By isolating high-toxicity particles for chemical treatment and allowing low-toxicity and non-toxic fractions to be safely discarded or recycled, the system cuts disposal costs and improves recycling options. This new approach provides a cost-effective, efficient, and environmentally friendly way to manage urban PM pollution.

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2. Li, Z., Chen, J., & Wang, Y., "Particulate Matter Pollution and its Health Impacts in Urban Environments," Environmental Monitoring and Assessment, vol. 192, no. 3, 2021.
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Design and Implementation of an IoT-Enabled Solar Tracking System with Environmental Sustainability and Voltage Monitoring

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Abstract:

This project presents an IoT-enabled dual-axis solar tracking system designed to maximize solar energy capture while ensuring environmental sustainability and voltage monitoring. The system uses a Light Dependent Resistor (LDR) sensor to track the sun's position for optimal panel alignment. Temperature and humidity are measured with a DHT11 sensor, while voltage sensors monitor both solar and battery outputs. Data are displayed on an LCD and transmitted via the Blynk IoT platform for real-time monitoring. A PIC16F877A microcontroller with an integrated ADC controls sensors and servo motors, while the ESP8266 Wi-Fi module enables remote monitoring and notifications. The system incorporates four key features: overheat protection, weather-based panel closure, remote monitoring, and automated Google Sheets performance logging.

By combining IoT-based monitoring, intelligent safety mechanisms, and performance analytics, the proposed system offers a reliable, efficient, and cost-effective solar energy solution. It enhances energy utilization, supports renewable adoption, and enables sustainable and smart power management for diverse applications.

Fig. Innovation and Uniqueness

References:

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3. Verma, S., & Patel, D., "Smart Sensor-Based Detection of Airborne Toxic Particles Using Arduino," IEEE International Conference on IoT and Applications, 2019.

AI-Enhanced State of Charge with Weather Integration

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Abstract:

This project presents an AI-enhanced State of Charge (SOC) estimation system integrated with real-time weather data to improve battery management accuracy and efficiency in renewable energy applications. Accurate SOC estimation is essential for optimal battery performance, safety, and longevity. Traditional methods rely on electrical parameters such as voltage, current, and resistance, often neglecting environmental factors like temperature, humidity, and solar radiation, which affect battery behavior, energy output, and degradation. The proposed model incorporates weather data and employs machine learning algorithms trained on datasets containing both electrical and environmental parameters. This enables precise, adaptive SOC predictions, while real-time monitoring ensures responsive management under varying conditions, preventing overcharging, deep discharge, and inefficiencies. Integrating AI with environmental data enhances battery reliability, energy efficiency, and supports smart, sustainable renewable energy storage solutions.

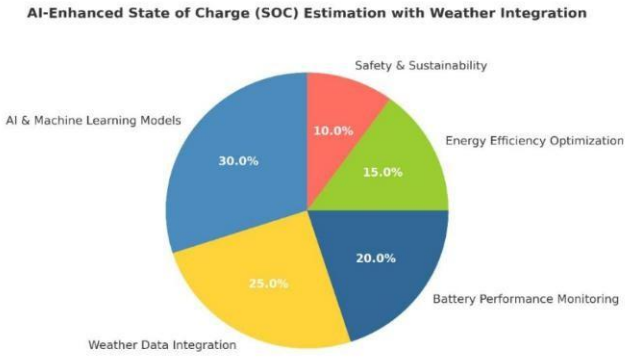

Fig. AI-Enhanced State of Charge Estimation with Weather Integration

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IoT-Enabled Paper Waste to Electricity Generation Integrated with Solar System

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Abstract:

The rapid increase in waste generation and energy demand calls for sustainable energy solutions. This project proposes an IoT-enabled hybrid system that converts paper waste into electricity using thermoelectric generator (TEG) technology, integrated with solar power for enhanced efficiency and reliability. Heat produced from burning paper waste powers TEG modules, while solar panels provide additional renewable energy during daylight hours. Real-time monitoring of key parameters such as temperature, voltage, and current is achieved through IoT sensors, with data transmitted to a cloud-based dashboard for analysis and decision-making. This dual-energy system minimizes paper waste, promotes green energy generation, and offers a cost-effective, eco-friendly solution for small-scale applications. The approach demonstrates potential for sustainable waste utilization and smart energy management in future smart cities.

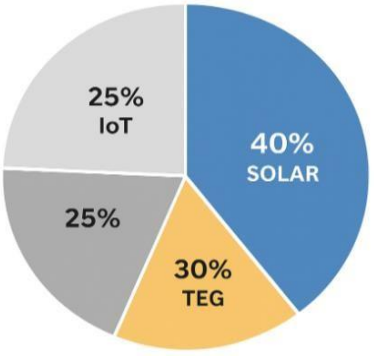

Fig. System Architecture of the Proposed Model

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AI-Driven Multi-Hazard Prediction and Decision Support System for Flood and Fire Management

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Abstract:

Natural disasters such as floods and forest fires pose significant threats to ecosystems, infrastructure, and human life. This project presents an AI-Driven Multi-Hazard Prediction and Decision Support System to improve disaster preparedness and response. The system integrates geospatial data, satellite imagery, and historical disaster records to identify high-risk areas. Machine learning models predict the likelihood and intensity of floods and fires, considering environmental factors such as temperature, humidity, vegetation density, rainfall, elevation, and water indices. In addition to prediction, the system offers decision support for emergency management. Graph-based algorithms determine optimal evacuation routes, while linear programming optimizes the allocation of essential resources like food, medical supplies, and rescue units according to shelter capacity and population density. A dynamic web-based dashboard, developed using Python and open-source tools, visualizes hazard maps, evacuation routes, and resource distribution strategies, enabling authorities to make real-time, data-driven decisions. This AI-powered framework enhances efficiency, scalability, and reliability in disaster management operations.

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Blockchain-Enabled Multi-Layered Product Authentication Against Counterfeit Products

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Abstract:

The rise of counterfeit products in global markets has created an urgent need for secure and transparent product authentication systems. This project presents a multi-layered product authentication framework that integrates Blockchain technology, QR codes, and Near Field Communication (NFC) to ensure reliable and tamper-proof verification. Each product is assigned a unique QR code linked to a Blockchain ledger containing essential information such as batch numbers, supplier details, and manufacture dates. The decentralized and immutable nature of Blockchain guarantees data integrity and prevents forgery. Consumers can instantly verify product authenticity using a smartphone app that reads the QR code and retrieves information from the Blockchain. Additionally, NFC tags embedded in product packaging serve as hardware-level identifiers, enabling contactless verification and further preventing duplication. By combining Blockchain, QR codes, and NFC, this system delivers a secure, scalable, and cost-effective solution that enhances supply chain transparency and consumer trust across industries like electronics, cosmetics, and pharmaceuticals.

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2. Ahmed, S., & Rafiq, M. (2018). QR code authentication using cryptographic hashing. International Journal of Network Security.
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Design And Development Of A Smart Rehabilitation Wheelchair With Integrated Physiotherapy And Path Navigation

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Abstract:

This project focuses on enhancing cybersecurity through intelligent malware detection techniques that effectively identify and prevent advanced threats. Traditional signature-based methods often fail to detect evolving malware, such as polymorphic and metamorphic variants, which modify their code structures to evade detection. To address this, the proposed system employs a machine learning–based approach that analyzes opcode sequences and behavioral patterns extracted from executable files. By training classifiers such as Random Forest, Support Vector Machine (SVM), and Gradient Boosting, the model distinguishes between legitimate and malicious software with high precision. The system continuously updates its learning model using real-time threat data, ensuring adaptability to emerging attack types. This smart detection framework not only improves accuracy and response time but also minimizes false positives, offering a robust defense mechanism for networks and systems. The proposed solution provides an efficient and scalable approach for modern malware analysis and prevention.

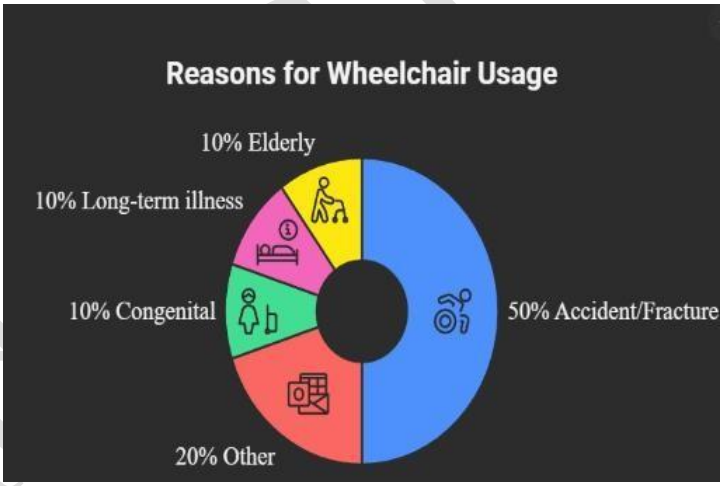

Fig. Wheelchair usage in Tamil Nadu

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Smart Human Computer Interaction Framework For Industrial Cognitive Assessment

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Abstract:

In the era of industrial advancement, achieving consistent product quality requires not only automated precision but also the optimization of human cognitive performance. This study presents a Smart Cognitive Evaluation Framework that integrates Human–Computer Interaction (HCI) principles, an intelligent cognitive monitoring system, and Looker Studio–based visualization to assess the cognitive efficiency of employees involved in industrial quality control. The framework evaluates key cognitive dimensions—memory span, visual attention, and pattern recognition—through a Computerized Neuro-Behavioral Test (CNBT) that includes the Letter Search Test, Picture Detection Test, and Memory Span Test. These tasks simulate real-world inspection scenarios using randomized images, letters, and numeric patterns, thereby replicating the decision-making complexities found in quality inspection processes. The application records each participant's response time and errors to generate a multidimensional dataset reflecting accuracy and cognitive load. The data are visualized through interactive Looker Studio dashboards, offering real-time insights into cognitive performance. Statistical analysis reveals significant correlations between cognitive fatigue, task duration, and error rate, underscoring the impact of cognition on inspection accuracy. The findings affirm that integrating cognitive assessment systems with data-driven visualization enhances workforce intelligence, decision-making, and operational quality, positioning cognitive analytics as a key enabler in smart manufacturing.

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AI Powered Resume Screening System

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Abstract:

Recruitment is one of the most time-consuming and challenging tasks in human resource management, often involving manual screening of numerous resumes to identify the best candidates. Traditional hiring methods are not only labor-intensive but also susceptible to human bias and inconsistency. To overcome these limitations, this project presents an AI-Powered Resume Screening System that utilizes Natural Language Processing (NLP), Machine Learning (ML), and Semantic Analysis to automate candidate evaluation. The system extracts key details such as skills, education, experience, and certifications from resumes and matches them with job descriptions to generate a suitability score. Candidates are then ranked based on relevance, allowing recruiters to focus on top-qualified applicants. Furthermore, Explainable AI (XAI) integration ensures transparency by clarifying how ranking decisions are made. This intelligent system enhances recruitment efficiency, minimizes bias, and supports fair, data-driven hiring in modern organizational environments.

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VoiceGuard: Enhancing Deepfake Audio Detection Using Spectral Fusion

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Abstract:

The emergence of advanced generative speech models like WaveNet and VALL-E has made synthetic voices nearly indistinguishable from human speech, posing serious risks such as identity theft and evidence manipulation. This research introduces **VoicGuard**, a hybrid ensemble-based framework designed to enhance deepfake audio detection through spectral fusion. The system integrates adaptive preprocessing with a multi-domain feature extraction module that computes temporal, spectral, cepstral, and perceptual descriptors to capture distinct synthetic artifacts. To improve robustness, the model employs SMOTE for data balancing and combines Random Forest, Gradient Boosting, SVM, and a shallow Neural Network through meta-level probabilistic fusion. Experimental results on multiple datasets achieved 96.3% accuracy, an F1-score of 0.963, and a ROC-AUC of 0.992, outperforming baseline methods. SHAP-based explainability analysis highlights MFCC variance, spectral centroid, and chroma stability as key discriminative features. VoicGuard demonstrates strong adaptability against unseen generative models, ensuring reliable deployment in digital forensics and voice authentication systems.

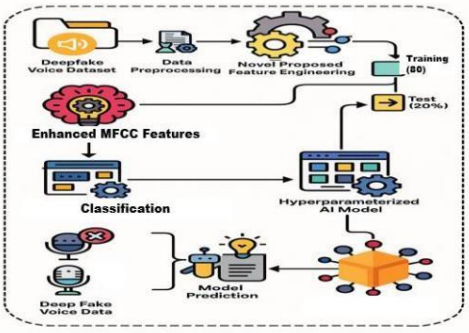

Fig. Deepfake Audio Detection Framework.

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Utilizing IoT for Early Prevention of Panama Disease in Banana Crop

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Abstract:

Panama disease (Fusarium oxysporum f. sp. cubense) poses a severe threat to banana cultivation, leading to significant yield losses worldwide. Traditional detection methods rely on visible symptoms that appear only after the infection spreads, reducing control efficiency. This project introduces an IoT-based smart monitoring system for early detection and prevention of Panama disease. The system employs an Arduino Uno integrated with DHT11, soil moisture, TDS, color, and LDR sensors to monitor vital environmental and soil parameters such as temperature, humidity, salinity, and leaf color changes. Data collected from the sensors are continuously analyzed and compared with predefined thresholds to identify early warning signs. Alerts are generated through the Serial Monitor to prompt timely intervention. Designed for rural and offline operation, the system is cost-effective, reduces chemical use, supports sustainable farming, and empowers farmers with real-time insights for disease prevention and crop health management.

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MumCare – IoT Based Pregnancy Health Monitoring App

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Abstract:

Pregnancy is a critical period requiring continuous monitoring of maternal and fetal health to prevent complications. Traditional hospital practices involve periodic checks, which may delay detection of sudden changes in vital signs. This project proposes **MumCare**, an IoT-based pregnancy health monitoring system integrated with a mobile application for real-time surveillance. The system employs wearable sensors, including a pulse oximeter, heart-rate sensor, blood-pressure sensor, and temperature sensor, to continuously capture maternal physiological data even during routine activities. Data is transmitted wirelessly via Bluetooth or Wi-Fi to the mobile application, which displays readings, maintains daily records, and triggers alerts if anomalies are detected. Machine learning algorithms analyze historical data to predict potential pregnancy complications such as preeclampsia, hypoxia, or high fever. The system also supports electronic health records for remote consultation. By combining IoT, mobile computing, and predictive analytics, MumCare enables early detection of risks, enhancing maternal safety and healthcare accessibility, particularly in rural areas.

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Nalamaa: AI-based Wellness Assistant for Elders

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Abstract:

As the global population ages, older adults face significant challenges in managing their health and well-being, including medication adherence, understanding medical reports, maintaining physical activity, and coping with social isolation. These challenges are exacerbated by vision impairments, limited digital literacy, and the lack of age-friendly technologies. To address these issues, this study presents **Nalamaa**, an AI-driven wellness assistant that enables elders to independently manage physical and emotional health. The application is hardware-free, accessible, and supports multiple regional languages through generative AI and voice assistance. Nalamaa consists of four main modules: (1) voice-enabled medication reminders, (2) AI-based medical report simplification with translation support, (3) an empathetic generative AI chatbot for emotional support and mood tracking, and (4) personalized diet and fitness recommendations tailored to individual preferences. Designed with intuitive interfaces and proactive voice prompting, Nalamaa promotes self-sufficiency, health monitoring, and enhanced quality of life for older adults.

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Identification of Spoiled Mushrooms Using AI-Based Technology

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Abstract:

Mushrooms are highly perishable and require timely quality assessment to prevent health risks and reduce food waste. Conventional manual inspection is inconsistent and labor-intensive. This work proposes an AI-based system for automated identification of spoiled mushrooms using image processing and deep learning. High-resolution images are preprocessed to enhance color, texture, and morphological features. Feature extraction is performed and fed to Convolutional Neural Network (CNN) classifiers trained to distinguish fresh from spoiled samples. The model is optimized for real-time deployment and demonstrates high precision and recall on test sets. Designed for integration with sorting lines and retail quality-control systems, the solution reduces labor, improves food-safety compliance, and minimizes post-harvest losses. The proposed approach is scalable and adaptable to different mushroom varieties, offering a practical tool for supply-chain freshness assurance.

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Smart Inhaler Monitoring System

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Abstract:

Asthma and Chronic Obstructive Pulmonary Disease (COPD) are prevalent chronic respiratory conditions that require strict medication adherence for effective management. Poor compliance leads to health deterioration, increased hospital visits, and higher treatment costs. This project proposes a Smart Inhaler Monitoring System leveraging sensor technology, IoT connectivity, and mobile integration to enhance adherence. A compact sensor module embedded in the inhaler detects actuation events, capturing parameters such as date, time, and dosage count. Data is transmitted wirelessly to a mobile application, which provides personalized reminders, visual adherence reports, and alerts caregivers or healthcare professionals in cases of prolonged non-adherence. Laboratory simulations demonstrated detection accuracy of 90–95%, while user feedback confirmed the system's ease of use and satisfaction. The system bridges communication between patients and doctors, promotes preventive healthcare, and ensures consistent treatment adherence. This innovation is cost-effective, scalable, and patient-centric, improving medication management and overall quality of life for individuals with asthma and COPD.

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Multimodal Deep Learning Framework for Early Detection of Pancreatic Cancer

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Abstract:

Pancreatic cancer is highly lethal due to its late detection and aggressive progression. Early diagnosis is critical to improve survival and enable timely treatment. Conventional diagnostic methods relying solely on imaging or clinical data often fail to detect the disease at early stages. This research proposes a Multimodal Deep Learning Framework that integrates PET/CT imaging, clinical, genomic, and proteomic data for early pancreatic cancer detection. A 3D ResNet model extracts volumetric features from PET/CT scans, while a Dense Neural Network (DNN) processes clinical and molecular data. Features from all modalities are fused using a late fusion strategy to preserve unique information. The fused vector is classified using ensemble models including XGBoost, Random Forest, and SVM, facilitating performance comparison. A web-based interface developed with AngularJS and Node.js allows data upload, classifier selection, and visualization of metrics such as accuracy, precision, recall, F1-score, and AUC-ROC. Experimental results demonstrate improved diagnostic accuracy, supporting timely clinical decision-making and enhancing survival prospects.

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ZONEBAND – Adaptive Wearable for Safety and Supervision

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Abstract:

Continuous presence in designated zones is critical for effective field operations. However, prolonged absence from assigned areas often goes unnoticed, causing delayed responses and compromised safety. To mitigate this, we propose **ZONEBAND**, a wearable smart band system for adaptive safety and supervision. The device continuously monitors location through embedded GPS and motion sensors. Alerts are automatically sent to authorities if absence is detected beyond a preset duration (e.g., five or ten minutes). Biometric or motion-based authentication detects device swaps or removals, triggering swap alerts. A universal charging system ensures uninterrupted monitoring. Additionally, the device tracks vital signs and inactivity patterns, generating wellness alerts when anomalies are detected. The system operates passively and non-intrusively, maintaining workflow continuity while enabling rapid intervention. **ZONEBAND** enhances safety, prevents misuse, prioritizes personnel well-being, and improves operational efficiency through intelligent, technology-driven oversight.

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HVAC Design for College Buildings using IoT

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Abstract:

The integration of the **Internet of Things (IoT)** in HVAC (Heating, Ventilation, and Air Conditioning) systems provides significant enhancements in efficiency, monitoring, and control. IoT-enabled HVAC systems connect various components and equipment to the internet, enabling **real-time remote monitoring** of temperature, humidity, air quality, and operational status of critical devices such as chillers, AHUs, and pumps. This connectivity allows facility managers to monitor and control HVAC systems from anywhere, ensuring optimal environmental conditions, energy efficiency, and predictive maintenance. By leveraging IoT, college buildings can achieve improved indoor comfort, reduced energy consumption, and faster response to system anomalies, making HVAC operations smarter and more sustainable.

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AI-Enabled Smart Classroom: Monitoring Mobile Phone Usage with Real-Time Alerts

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Abstract:

The increasing use of mobile phones among students poses a challenge to maintaining focus and discipline in classrooms. This research proposes an **AI- and IoT-powered Mobile Detection and Monitoring System (MDMS)** designed for academic environments. The system employs a three-tier IoT architecture for seamless sensing, processing, and monitoring. The **Sensing Layer** uses a camera module integrated with the YOLOv8 deep learning model to detect mobile phone usage in real time with high accuracy. Visual data are processed locally via an **Edge AI Processing Unit**, reducing latency and ensuring privacy. The **Control Layer**, managed by an ESP32 microcontroller, executes a **Timetable-Based Automation Algorithm (TBAA)** to activate monitoring during lecture hours. A **Violation Logging and Alert System (VLAS)** records repeated offenses and provides immediate notifications to teachers. The **Application Layer** features a teacher mobile app for live monitoring, violation tracking, and automated reports. Experimental results show that MDMS reduces distractions, improves discipline, and fosters a focused, AI-assisted learning environment.

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A Smart IoT and Machine Learning Framework for Influenza Pathogen Detection

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Abstract:

Rapid transmission of infectious diseases necessitates intelligent, real-time pathogen detection systems. This research presents an **IoT-based prototype** integrating environmental sensing with **machine learning** to enable preliminary influenza pathogen detection. The system uses a DHT22 sensor to monitor temperature and humidity, an MQ-135 sensor for air quality, and a potentiometer to simulate dynamic environmental changes. Collected data are analyzed using machine learning algorithms to classify high-risk conditions favorable for pathogen proliferation. Experimental results demonstrate that low-cost IoT components can provide continuous monitoring and early alerts in real-world settings. Future work will incorporate electrochemical biosensors for **direct molecular-level detection** of influenza pathogens, enhancing accuracy and clinical relevance. By combining IoT sensing, predictive machine learning, and biosensing, this framework offers a **scalable, intelligent platform** for real-time pathogen surveillance, suitable for healthcare facilities, public spaces, and agricultural storage environments to support timely interventions and reduce airborne disease risks.

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A Machine Learning Framework for Real-Time Credit Risk Assessment and Scoring

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Abstract:

The rapid growth of digital financial services has heightened the demand for **accurate, efficient, and interpretable credit risk assessment models**. Conventional credit scoring methods often struggle with the complexity and volume of modern financial data. This research presents a comprehensive **end-to-end framework** for credit risk modeling, from data preprocessing to deployment as a real-time web application. The system utilizes a **Gradient Boosting (XGBoost)** model trained on an extensive dataset including customer demographics, loan details, and credit bureau history. The model achieves exceptional discriminative performance, with an AUC of 98% and a Gini coefficient of 96%, surpassing industry standards. To address interpretability challenges, **SHAP (SHapley Additive exPlanations)** is integrated for localized model explanation. The model is deployed through a **user-friendly Streamlit web interface**, enabling loan officers to efficiently assess creditworthiness. This framework demonstrates a practical, predictive, and transparent solution for modern credit risk management.

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Brainvision: Brain Stroke Classification and Analysis with XAI

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Abstract:

Brain stroke is a medical emergency that requires rapid diagnosis and treatment. **Computed Tomography (CT) scans** are widely used for stroke detection, but manual interpretation can be time-consuming and prone to errors. This study presents a **deep learning-based framework** for automatic classification of brain strokes using CT scan images. Pre-trained models such as **EfficientNet, DenseNet, and ResNet** are employed to improve detection accuracy, while **Grad-CAM** is integrated for model interpretability. The dataset of CT scans is used to train and evaluate the models, and their performance is compared using **accuracy, sensitivity, specificity, and AUC** metrics. The EfficientNet model achieved the highest accuracy of approximately **97%**. Grad-CAM heatmaps provide visual explanations by highlighting affected regions of the brain, assisting radiologists in understanding the model's decisions. This framework demonstrates the potential of **deep learning and explainable AI (XAI)** in improving stroke detection and can be deployed in clinical practice to enhance timely diagnosis and patient outcomes.

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SignSiamNet: Offline Signature Verification Using ResNet18 and Siamese Networks

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Abstract:

Signature verification is essential for personal authentication and security systems. Traditional methods rely on dynamic features such as stroke order, pressure, and speed, requiring specialized hardware like stylus-enabled devices or biometric pads. However, these approaches are impractical for **offline signatures** obtained from scanned or printed documents. This study proposes an **offline signature verification system** leveraging deep learning, utilizing **ResNet18** for feature extraction and a **Siamese neural network** for learning signature similarity. The model is trained on publicly available datasets, analyzing signature pairs to classify them as genuine or forged. This approach eliminates the need for specialized hardware, enabling accessibility through standard image capture using cameras or scanners. Additionally, a **lightweight demo interface** is developed to facilitate usability and testing. Experimental results demonstrate promising accuracy and robustness, indicating the potential of the proposed framework for practical **biometric authentication applications**.

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Comprehensive Survey On The Efficacy Of Hybrid Cnn-Lstm Models For Network Intrusion Detection Systems

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Abstract:

The escalating sophistication of cyber threats necessitates the development of advanced, intelligent **Network Intrusion Detection Systems (NIDS)**. Traditional signature-based methods often fail to detect zero-day attacks and novel threats, highlighting the need for deep learning-based anomaly detection. Hybrid models combining **Convolutional Neural Networks (CNNs)** and **Long Short-Term Memory (LSTM) networks** have shown significant promise in enhancing the accuracy and robustness of NIDS.

This survey provides a comprehensive analysis of the efficacy of **Hybrid CNN-LSTM models** for network intrusion detection. It covers advancements in hybrid architectures, feature processing techniques, and their applications in both packet-based and flow-based network traffic analysis. By reviewing extensive literature and experimental results, performance metrics such as accuracy, precision, recall, F1-score, and false positive rates are assessed. The study also discusses the benefits and limitations of these hybrid approaches, challenges in real-world deployment, and potential directions for future research.

This survey serves as a valuable resource for cybersecurity researchers, network engineers, and practitioners, supporting the development of more resilient and reliable defensive systems for modern network infrastructures.

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A Survey of Plant Disease Identification and Classification Using Machine Learning Models

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Abstract:

Machine learning-based plant disease identification and classification systems have shown promising results in improving the accuracy and efficiency of plant disease detection. These systems often use artificial neural networks to classify plant images into different disease categories.

The development of a deep learning-based plant disease classification system involves collecting a large dataset of labeled images of healthy and diseased plants. The dataset is preprocessed using techniques such as resizing, normalization, and data augmentation to enhance its quality and diversity. The learning model is then trained on the preprocessed dataset to identify patterns in the images.

Once trained, the model can classify new plant images into disease categories. Each new image is processed by the model, which outputs a probability score for each disease class. The class with the highest probability score is assigned to the image. AI-based plant disease classification systems have shown great potential in improving both the speed and accuracy of disease identification, which is critical for effective plant disease management. These systems can aid farmers and researchers in detecting plant diseases early, enabling timely intervention to prevent the spread of diseases and improve crop yield.

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An Intelligent Solar-Powered Water Distribution and Purification System Employing IoT and AI

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Abstract:

In rural and isolated areas, the shortage of clean water persists due to unstable power supplies, inadequate purification systems, and the absence of advanced monitoring mechanisms. This project proposes an **AI and IoT-enabled Smart Solar-Powered Water Purification and Multi-Mode Distribution System with Self-Cleaning Filters**, which integrates predictive intelligence, automation, and renewable energy to ensure efficient water management. The system utilizes solar energy for uninterrupted off-grid operation, while an AI algorithm predicts variations in water quality and dynamically optimizes purification stages. A self-cleaning UV-assisted filtration unit enhances durability and minimizes manual maintenance. Through Internet of Things (IoT) connectivity, real-time data on water quality, flow rate, and system health are transmitted to a centralized cloud dashboard for monitoring and analytics. The multi-mode distribution module features manual tap control, RFID-based prepaid access, and automated tank refilling to ensure equitable and waste-free water distribution. This innovation demonstrates how self-maintenance filtration, IoT-based monitoring, and AI-driven predictive control can create an intelligent, autonomous, and sustainable clean-water solution for rural and off-grid regions. Future developments aim to integrate deep learning analytics and blockchain-enabled usage tracking to enhance transparency and governance in water management.

Fig. Block diagram of the proposed AI and IoT-enabled solar-powered water purification and distribution system

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3D VoxResNet for Lung Disease Classification: An Architectural Perspective

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Abstract:

Accurate classification of lung diseases using volumetric CT scans is critical for early diagnosis and effective treatment planning. Building upon prior comparative analyses, this paper focuses on the **3D VoxResNet** architecture and investigates its structural strengths that contribute to superior performance in lung disease classification. The study explores voxel-wise residual learning, deep feature propagation, and spatial context preservation to understand how these design components enhance model accuracy, robustness, and interpretability. Through detailed architectural analysis and performance evaluation, the paper highlights how 3D VoxResNet leverages volumetric convolutional strategies to capture rich spatial dependencies across CT scan slices. The findings provide a deeper insight into architecture-driven improvements in 3D medical image analysis and serve as a valuable reference for future advancements in deep learning-based diagnostic systems.

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AI-Driven Environmental and Stress-Responsive Calming System for Zoo Animals

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Abstract:

Zoo animals often experience stress due to fluctuating environmental factors, excessive noise, or irregular human activity, which can negatively affect their health and behavior. This research proposes an AI-driven environmental and stress-responsive calming system that continuously monitors zoo enclosures using a network of IoT sensors and intelligent data analytics. The sensing layer integrates temperature, humidity, air quality, light, sound, and motion sensors to detect environmental variations and behavioral anomalies. Real-time data are processed through an ESP32-based control unit and transmitted to a cloud platform through Wi-Fi and LoRa communication, where a machine learning model predicts stress levels based on environmental and behavioral parameters. When stress indicators exceed safe thresholds, the system automatically activates adaptive calming mechanisms—such as adjusting light intensity, temperature, or playing soothing sounds—to restore comfort. The system provides a user dashboard for zookeepers to visualize animal mood trends, environmental fluctuations, and intervention logs. Experimental simulations demonstrate that the proposed model can effectively reduce stress levels and maintain optimal living conditions, enhancing both animal welfare and management efficiency.

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Thulir: AI-Powered Smart Agriculture Platform for Crop Recommendation, Climate Alerts, and Resource Optimization

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Abstract:

The Thulir Web Application is an AI-powered AgriTech platform designed to help farmers adopt technology for sustainable farming. It integrates Artificial Intelligence (AI), Machine Learning (ML), and real-time data analytics to create a digital ecosystem that enhances decision-making and farm productivity. The platform addresses key agricultural challenges such as limited access to modern tools, lack of direct market connections, unpredictable weather, and poor crop planning. Thulir provides multiple smart modules including Tool Renting, Smart Connect Marketplace, AI-Based Disease Detection, Crop and Yield Prediction, as well as features like an AI-Based Crop Recommendation System, Climate Alert System, and Land Area Calculator. Using algorithms such as CNN, Random Forest, KNN, and SVM, the system recommends crops based on soil pH, humidity, temperature, and rainfall, along with guidance on fertilizer use and expected yield. The Climate Alert System leverages APIs and AI to notify farmers of severe weather events such as heavy rain, heatwaves, and storms. The Land Area Calculator uses GPS and Map APIs for accurate field measurements and better resource planning. With features including multilingual support, real-time weather forecasts, and agricultural news updates, Thulir bridges the gap between technology and rural farmers. By promoting digital inclusion, sustainability, and climate-smart farming, the platform aims to transform India's agricultural landscape and enhance the economic resilience of small and marginal farmers.

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Autonomous Cyber Defense Using AI-driven Intrusion Detection System

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Abstract:

The growing sophistication of cyberattacks, including SQL injection, cross-site scripting (XSS), and buffer overflow, poses major challenges to maintaining secure and resilient digital systems. Traditional intrusion detection systems (IDS) often rely on static signatures and manual rule updates, making them inefficient in identifying new and evolving threats. This project proposes an advanced solution titled *"Autonomous Cyber Defense Using AI-driven Intrusion Detection System"*, which combines Deep Neural Networks (DNNs) and Reinforcement Learning (RL) to detect, analyze, and mitigate cyber intrusions autonomously. The DNN component, implemented with TensorFlow, employs both convolutional and recurrent architectures to analyze behavior patterns and classify vulnerabilities with high accuracy—achieving up to 95% performance on benchmark datasets such as the Juliet Test Suite. Complementing this, the RL agent, modeled as a Markov Decision Process (MDP) and implemented using Stable Baselines3, simulates various attack scenarios in a sandboxed Docker environment. It learns through experience, optimizing its responses based on reward feedback to enhance detection precision and response adaptability over time. The system is delivered through a Flask-based web interface that allows users to upload application code, view real-time detection results, and receive detailed reports with automated mitigation recommendations. Additionally, interactive dashboards visualize threat heatmaps and learning progress, improving user understanding of system performance. Evaluated using precision, recall, and reward convergence metrics, the proposed system demonstrates strong scalability, adaptability, and autonomy. This project contributes to proactive cybersecurity by presenting an intelligent, self-learning, and scalable defense mechanism capable of tackling evolving and zero-day cyber threats effectively.

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Campus 361 – AI-Integrated Education Management and Career Recommendation System

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Abstract:

Our proposed web application provides a comprehensive online solution to streamline academic, administrative, and communication activities in educational institutions. Developed using Oracle APEX, it includes four customized login modules—Student, Parent, Educator, and Admin—each designed for specific user needs.

The Student module offers personal profiles, fee management, transport details, service requests, an online store, digital library, academic calendars, performance dashboards, assignments, exam results, and feedback forms. An integrated AI chatbot assists with queries and guidance. A key feature is the AI-Powered Career & Skill Recommendation System, which analyzes students' academic performance, interests, attendance, and extracurricular activities to recommend suitable career paths, suggest skills to learn with links to free resources (NPTEL, Coursera, edX), predict employability readiness via a skill gap dashboard, and connect students to internships and job opportunities. An AI career counselor chatbot provides personalized guidance, acting as a virtual mentor.

Educators can manage syllabi, assignments, and internal marks, while Parents monitor academic progress. The Admin panel centralizes user management, service requests, timetables, fee processing, and result uploads, ensuring efficiency and accountability. This platform transforms education by integrating academic management with career guidance, offering a secure, intelligent, and user-friendly system.

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Marine Macro Vision Using Deep Learning

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Abstract:

Marine litter is a prominent and serious form of marine pollution that poses direct threats to marine life, while also raising global concerns about its environmental and economic impacts. Floating marine macro litter (FMML) refers to objects larger than 2.5 cm that float in the upper layers of the ocean. With recent advancements in satellite imagery, remote sensing techniques have become a viable tool for detecting FMML.

This study introduces a convolutional neural network (CNN)-based method for identifying FMML using satellite imagery. FMML, being a mobile part of marine litter, can provide valuable insights into the primary sources, sinks, and pathways of litter in the marine ecosystem, as well as help evaluate the effectiveness of waste prevention strategies. The CNN model is designed to recognize FMML features and distinguish it from other objects in the ocean. Additionally, transfer learning is applied by utilizing pre-trained weights from a CNN model trained on a large natural image dataset.

In conclusion, the proposed CNN-based approach for detecting FMML using satellite images holds promise for tackling the growing issue of marine pollution. This method can help monitor the effectiveness of marine debris reduction regulations and identify areas in need of clean-up efforts.

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Deep CNN Based Facial Authentication System for E-Commerce Application

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Abstract:

Online transactions and deliveries in e-commerce platforms are increasing rapidly, leading to growing concerns about data security and identity verification. Traditional authentication methods such as passwords and one-time passwords (OTPs) are vulnerable to phishing, SIM swapping, and identity theft. To address these challenges, this study introduces a Deep Convolutional Neural Network (CNN)-based facial authentication system for secure e-commerce applications.

The proposed system replaces OTP-based verification with facial recognition during both user login and product delivery confirmation stages, ensuring a seamless and secure user experience. A CNN model is trained to accurately identify and verify user faces, incorporating liveness detection and anti-spoofing mechanisms to prevent unauthorized access. Additionally, the system is modularized as a custom PyPI library, enabling easy integration with e-commerce platforms via API calls. This deep learning–based approach enhances authentication reliability by eliminating dependency on external verification channels, thereby improving user trust and operational efficiency. The results demonstrate that CNN-based biometric authentication can significantly improve accuracy, reduce false acceptance/rejection rates, and provide real-time verification suitable for large-scale e-commerce ecosystems.

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AI-Driven Smart Waste Sorting, Reward & Traceability Kiosk System (Smart-WaRT System)

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Abstract:

The rapid increase in urban waste generation has intensified the need for intelligent and automated waste management solutions. Traditional waste segregation systems often rely on manual sorting, leading to inefficiency, contamination, and low recycling rates. To address these challenges, this project proposes the AI-Driven Smart Waste Sorting, Reward & Traceability Kiosk System (Smart-WaRT System), an integrated solution that leverages computer vision, Internet of Things (IoT), and cloud-based analytics to automate waste classification and incentivize recycling behavior.

The system employs a YOLOv8-based deep learning model trained on multi-class waste image datasets to accurately identify and sort waste into categories such as plastic, metal, paper, and organic materials. A Raspberry Pi-controlled kiosk integrates IoT sensors for weight and type detection, while the reward mechanism automatically credits user points via a mobile or RFID interface, promoting eco-friendly practices. Additionally, the system incorporates traceability for monitoring waste flow from collection to recycling centers, ensuring transparency and accountability. A Flask-based web dashboard visualizes analytics, including waste statistics, user participation, and environmental impact metrics. Experimental evaluation demonstrates high sorting accuracy and system scalability for real-world deployment in public and institutional environments. The Smart-WaRT System contributes to sustainable waste management by combining automation, data intelligence, and social motivation for a cleaner urban ecosystem.

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EyeTrackEdu: AI-Based Student Monitoring System for Attention Tracking

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Abstract:

The EyeTrackEdu system is an AI-powered education monitoring platform that enhances learning engagement and academic performance by analyzing real-time visual and emotional cues of students. It leverages Computer Vision, Deep Learning, and Emotion Recognition technologies to monitor attention levels, facial expressions, and gaze direction using standard webcam inputs. The system provides instructors with actionable insights through a dashboard that visualizes engagement levels, emotion trends, and focus duration for each student.

EyeTrackEdu addresses major challenges in remote and hybrid education such as reduced focus, lack of interaction, and limited teacher feedback. The platform integrates modules like Real-time Eye Gaze Tracking, Facial Emotion Detection, and Engagement Scoring, supported by deep learning models including CNN and FER (Facial Emotion Recognition) networks. The backend system processes visual data to classify attention states (focused, distracted, drowsy) and emotion categories (happy, neutral, confused, sad). The results are stored securely and visualized for instructors to personalize their teaching methods.

With features like real-time monitoring, emotion-based insights, and data-driven reports, EyeTrackEdu bridges the gap between technology and learning psychology, promoting more focused and inclusive digital classrooms. Future extensions include multimodal behavior analysis and adaptive learning recommendations using reinforcement learning models.

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AI Advocate: An Intelligent Legal Assistance System Using NLP and Machine Learning

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Abstract:

The AI Advocate is an intelligent, AI-powered legal assistance platform designed to simplify and automate legal processes using Natural Language Processing (NLP) and Machine Learning (ML). The system functions as a virtual legal advisor, capable of understanding user queries, analyzing legal documents, and providing relevant case references and judgments. By leveraging NLP techniques such as text classification, semantic analysis, and named entity recognition, the AI Advocate interprets complex legal language to deliver contextually accurate responses and recommendations.

The platform integrates advanced algorithms trained on legal datasets to predict case outcomes, summarize legal texts, and assist in document drafting. Users can interact through a conversational interface that enables smooth and natural dialogue between the system and the user. This innovation aims to reduce dependency on manual legal research, offering quick, accessible, and affordable legal guidance for individuals, students, and professionals.

The system architecture combines data preprocessing, AI model training, and result interpretation through a unified dashboard. It bridges the gap between citizens and the legal community by providing data-driven insights and automated reasoning. Future enhancements include voice-based interactions, multilingual law interpretation, and integration with real-time court databases for intelligent case retrieval.

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AI-Based Blood Group Detection Using Fingerprint in Machine Learning

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Abstract:

Blood group identification is a vital step in medical diagnosis, emergency treatments, and safe blood transfusions. Traditional testing methods require laboratory facilities, trained staff, and take time, which can delay urgent care. To address this, our project introduces an AI-based system that can detect a person's blood group quickly and accurately using fingerprints.
Since every fingerprint carries unique biometric patterns linked with genetic information, we train a machine learning model to analyze these features and classify them into their respective blood groups. This approach reduces dependency on invasive blood tests, saves time, and can be easily integrated into portable devices for use in hospitals, rural clinics, or emergencies. By combining biometrics with artificial intelligence, the project aims to provide a fast, reliable, and non-invasive alternative for blood group detection that supports smarter healthcare solutions.

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TaskPilot AI – Your Smart Planner That Acts for You

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Abstract:

In today's fast-paced world, managing time and tasks efficiently is more important than ever. People often struggle to keep up with busy schedules, multiple responsibilities, and shifting priorities. TaskPilot AI is an AI-powered smart planner built to help users stay organized, focused, and in control. Unlike traditional planners or reminder apps, TaskPilot leverages artificial intelligence, including machine learning and natural language processing, to understand user habits and act proactively. It can schedule tasks, send reminders, prioritize deadlines, and even adjust your calendar automatically when plans change.

The system learns from daily routines and makes smart decisions to improve productivity. For example, if it notices that a user is most productive in the morning, it schedules critical tasks during that time. If a meeting gets canceled, it reschedules the day to optimize time usage. This paper explores TaskPilot's architecture, technologies, and practical benefits. Through case studies and real user feedback, we demonstrate its effectiveness in reducing mental stress, saving time, and simplifying daily planning. TaskPilot aims to provide not just a planner, but a digital assistant that thinks and acts for you—making life smarter, simpler, and more manageable.

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WiSpy – Wi-Fi Network Threat Scanner

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Abstract:

WiSpy is an advanced Wi-Fi threat scanner designed to detect vulnerabilities and monitor suspicious activity across wireless networks. It provides comprehensive scanning capabilities, identifying all connected devices on a network, analyzing their behavior, and checking the strength and type of encryption protocols being used. By pinpointing weak security configurations, WiSpy helps users address risks such as open networks, outdated encryption standards, or easily exploitable setups.

A standout feature of WiSpy is its ability to identify rogue access points, often created by attackers to intercept data or gain unauthorized access. The system also includes MAC address lookup to verify device legitimacy and detect unknown or potentially malicious devices in real time. Optional live traffic monitoring further enhances its effectiveness by revealing unusual data flows or sudden spikes in activity that may indicate an attack or intrusion.

WiSpy automatically generates structured reports detailing detected vulnerabilities, suspicious behaviors, and recommended security improvements. These reports are ideal for students, researchers, and cybersecurity professionals seeking hands-on experience with network threats. The intuitive interface ensures accessibility for beginners and advanced users alike. By combining real-time monitoring, device scanning, and detailed reporting, WiSpy offers a practical solution to strengthen wireless network defenses and stay ahead of emerging cybersecurity threats.

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Real-Time CCTV-Based Student Malpractice Detection Using Face and Hand Analysis

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Abstract:

With the increasing adoption of online and offline examination surveillance, detecting potential malpractice in real-time is critical. This study proposes a system that leverages computer vision and machine learning techniques, including facial landmark detection and hand gesture recognition, to identify suspicious behaviors such as talking, looking around, or using a mobile phone. The system integrates IP camera streams, performs behavior analysis in real-time, and logs incidents along with visual evidence for review.

We employ lightweight convolutional neural networks alongside a real-time pose estimation model (e.g., MediaPipe or OpenPose) to maintain live performance with low latency. Suspicious behavior events are flagged dynamically and logged with timestamps and frame indices for later review. In experiments conducted in a controlled exam environment, our system achieved an overall detection accuracy of approximately 90–95%, with a false-positive rate under 5%. The proposed method enhances exam integrity, reduces the need for full manual proctoring, and demonstrates feasibility for deployment in real classrooms.

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Smart Fan Cleaning System Using IoT

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Abstract:

Cleaning a ceiling fan might seem like a simple job, but most people delay it because it is either messy or risky. The Smart Fan Cleaning System was created to automate this task. It uses a small robotic setup that detects dust accumulation and cleans the fan without human intervention.

The system is adaptive: it adjusts itself based on fan height, monitors fan usage, and tracks dust levels to determine optimal cleaning frequency. This approach saves electricity, extends fan life, and maintains efficiency. By automating the cleaning process, it reduces the need for manual labor, especially in high or hard-to-reach areas, minimizing accidents and saving time. Early trials demonstrated that fans cleaned by the system ran more smoothly and improved air quality in the surrounding environment.

A mobile app complements the setup, allowing users to activate or deactivate the cleaning function, check system updates, and adjust schedules as needed. By implementing this system, Smart Fan Cleaning transforms a mundane household chore into an automated process, keeping both fans and indoor air clean.

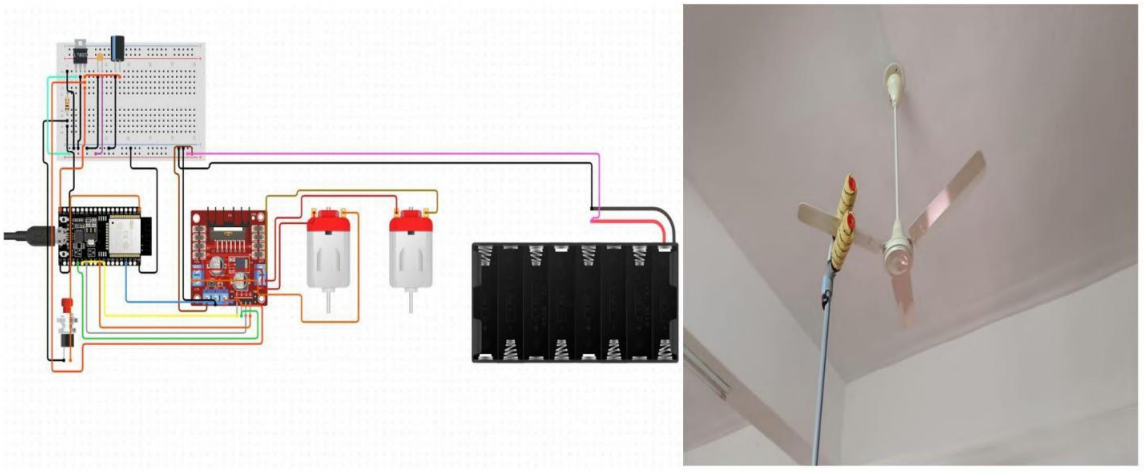

Fig. Circuit Diagram and Final Product of Smart Fan Cleaning System Using IoT

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Intelligent Human Demographic Classification Using CNN

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Abstract:

Facial recognition technologies have rapidly advanced, enabling applications across security, retail, healthcare, and human-computer interaction. This project presents a smart system capable of detecting age and gender from facial images using computer vision and deep learning techniques. The primary objective is to analyze human facial features in real-time and accurately classify individuals into predefined age groups and gender categories.

The system utilizes OpenCV for face detection and a pre-trained Convolutional Neural Network (CNN) model to predict age and gender. Once a face is detected from a live camera feed or image input, it is passed through the trained model, which returns the estimated age range and gender (male or female). The model is trained on large annotated datasets, such as the Adience or UTK Face dataset, which consist of thousands of labeled face images with diverse age and gender variations.

The proposed system offers an efficient, non-intrusive, and real-time solution with potential use in marketing analytics, smart surveillance, access control, and personalized user experiences. Furthermore, it is designed to run on standard hardware, making it suitable for integration into low-cost, real-world applications.

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Real-Time Object Detection Voice Assistant for the Visually Impaired Using YOLO and Audio-Based Alert System

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Abstract:

Traditional AI assistants face significant limitations, including lack of multi-modal interaction capabilities, absence of real-time computer vision integration, limited accessibility features for visually impaired users, and insufficient support for emergency communication and document processing tasks. The main objective of this research is to develop a comprehensive multi-modal AI assistant that combines voice recognition, computer vision-based object detection, document-to-speech conversion, and emergency communication capabilities, providing a unified intelligent platform for diverse user needs and accessibility requirements.

Existing AI assistants lack comprehensive multi-modal functionality for users with disabilities, insufficient integration of computer vision with voice-based interfaces for real-time environmental awareness, limited document accessibility through text-to-speech conversion, and inadequate integration of emergency communication features. Our methodology addresses these gaps by employing YOLOv8 architecture for real-time object detection, speech recognition APIs for natural language command processing, Pytesseract OCR technology for document text extraction and conversion to speech, and integrated emergency communication systems using email-to-SMS gateways. Comprehensive voice feedback mechanisms provide continuous audio interaction, enhancing accessibility and user experience.

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A Deep Learning Framework for Generating Spatially-Constrained Medical Information Codes

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Abstract:

Ensuring medication safety remains a fundamental challenge in modern healthcare systems. A critical yet often overlooked issue arises when patients purchase small quantities of tablets—typically 2–3 units—where packaging is trimmed during dispensing, inadvertently removing vital information including drug names, dosage specifications, manufacturer details, and expiry dates. This information gap poses serious health risks, as patients may consume incorrect medications or expired drugs without proper identification. Conventional pharmaceutical packaging relies on printed labels designed for bulk quantities, making traditional approaches inadequate for individual unit dispensing.

In this work, we present an innovative framework for embedding complete drug information on single-tablet packaging through AI-compressed QR codes. The core challenge lies in the spatial limitations of individual tablet packaging, where standard QR codes cannot fit. We address this by implementing a deep autoencoder architecture that compresses QR codes into compact latent space representations suitable for minimal packaging footprints. Our methodology involves training multiple autoencoder variants including Convolutional Autoencoders (CAE), Variational Autoencoders (VAE), and Deep Autoencoders (DAE) on a large dataset of pharmaceutical QR codes containing diverse medication information.

We evaluated reconstruction accuracy, compression ratio, and decoding speed across all models. The Variational Autoencoder demonstrated superior performance, achieving a reconstruction accuracy of 98.7% with a compression ratio of 6:1, while maintaining an average decoding time of 0.3 seconds on standard mobile devices. Our decoder successfully reconstructs the original QR code from the latent representation during scanning, providing seamless access to comprehensive medication details via embedded URLs. This approach preserves existing printed information while introducing an intelligent digital identification layer, effectively mitigating medication errors in single-unit dispensing scenarios. Future research may incorporate attention mechanisms and integrate with centralized pharmaceutical tracking systems for enhanced patient safety.

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Humanoid Chatbot with Sentiment-Based Analysis (Open-Source Implementation)

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Abstract:

In the modern era of artificial intelligence, human-computer interaction is shifting toward natural, emotional, and expressive communication. This project introduces a humanoid chatbot that performs sentiment-based analysis using open-source tools to create human-like, emotionally intelligent responses. The system bridges the gap between technical automation and emotional understanding, enabling a more humanized digital experience.

The chatbot is capable of recognizing human emotions through facial expressions using **DeepFace** and generating appropriate responses via advanced open-source language models such as **LLaMA** and **Mistral** implemented through **Ollama**. **Whisper** is employed for speech recognition, converting real-time voice input into text, while **Coqui TTS** transforms response text back into natural-sounding speech, enabling bidirectional communication that is realistic and adaptive.

To enhance the visual component, **SadTalker** or **Wav2Lip** is integrated to animate the chatbot's avatar with accurate lip synchronization based on generated speech. Grammar correction and linguistic improvement are handled by **LanguageTool**, ensuring that every response is polished and linguistically accurate. Sentiment analysis further refines the chatbot's tone, allowing it to respond empathetically to the user's emotional state.

The proposed system, developed using **React** for the front end and **Flask** for the backend, demonstrates the potential of open-source AI ecosystems to create immersive, expressive, and emotionally aware digital assistants. By eliminating reliance on proprietary APIs, this humanoid chatbot showcases a scalable, cost-effective, and transparent approach to the future of human–AI interaction.

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Smart Corridor Safety System

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Abstract:

Ensuring safety in high-traffic corridors of schools, hospitals, offices, and public buildings is a significant challenge, as overcrowding, obstacles, and unexpected hazards can lead to accidents and disruptions. The Smart Corridor Safety System (SCSS) addresses this problem by combining real-time surveillance, artificial intelligence, and IoT-based sensor networks to monitor corridor environments continuously and respond proactively to potential risks. The system employs CCTV cameras and sensors to capture visual and environmental data, including human presence, movement patterns, temperature variations, smoke, and potential obstacles. Computer vision and machine learning algorithms process this data to detect overcrowding, identify hazards such as fallen objects or slippery surfaces, and recognize emergency situations like fire or gas leaks. Once a risk is identified, the system triggers automated alerts and notifications to administrators, security personnel, or emergency responders, ensuring rapid intervention. Additionally, SCSS can activate dynamic lighting, guiding signals, and other safety mechanisms to facilitate safe movement of individuals within corridors. The integration of real-time monitoring, predictive analytics, and automated response allows the system to not only detect issues but also prevent accidents before they occur. The proposed system enhances situational awareness, optimizes human resource allocation for supervision, and significantly reduces the likelihood of accidents in busy corridors. By leveraging advanced technologies and intelligent decision-making, SCSS represents a proactive and comprehensive approach to corridor safety, ensuring safer and more organized environments in institutions, workplaces, and public spaces.

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Brain Tumor Detection Using Deep Learning Techniques

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Abstract:

Brain tumor detection from magnetic resonance imaging (MRI) is an essential step in medical diagnosis and treatment planning. Manual inspection of MRI scans is often labor-intensive, time-consuming, and prone to human error, which may delay accurate diagnosis and patient care. To overcome these challenges, this study presents an automated deep learning–based system for the precise classification of brain tumors using Convolutional Neural Networks (CNN). The model is trained on a comprehensive MRI dataset containing four tumor categories: Glioma, Meningioma, Pituitary Tumor, and No Tumor. Prior to training, extensive preprocessing techniques such as image normalization, resizing, and noise reduction are applied to enhance image quality and improve model robustness. The CNN architecture efficiently extracts hierarchical spatial features from MRI images, allowing accurate differentiation between various tumor types. Through multiple convolutional and pooling layers, the network learns discriminative patterns that contribute to high classification performance. To ensure practical usability, the trained model is integrated into a *web-based interface* built using a lightweight Python framework. This interface enables users to upload MRI images, automatically preprocesses them, performs real-time prediction, and displays the tumor classification results with confidence levels. The proposed system demonstrates the effectiveness of deep learning in the medical imaging domain by offering a fast, reliable, and user-friendly diagnostic support tool. It reduces the dependence on manual interpretation and can assist radiologists in early and accurate tumor identification, ultimately improving diagnostic efficiency and contributing to better patient outcomes.

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Smart Face Pay: AI-Enabled Secure Embedded Device for Digital Transformation

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Abstract:

In today's fast-evolving digital economy, secure and seamless payment systems are essential for enhancing user convenience and reducing transaction risks. Smart Face Pay is an innovative AI-enabled embedded payment system that integrates facial recognition technology with IoT and embedded hardware to deliver a contactless, fast, and secure digital payment experience. The proposed system replaces traditional payment methods such as cards, cash, and mobile applications with an intelligent face-based authentication mechanism. The system employs deep learning-based facial recognition algorithms, leveraging convolutional neural networks (CNNs) for real-time face detection, feature extraction, and matching. The embedded device, powered by a Raspberry Pi (or similar microcontroller), integrates a camera module, secure payment gateway, and cloud-based database for managing user credentials and transaction logs. The device ensures data privacy and security through end-to-end encryption and multi-layer authentication mechanisms.

Smart Face Pay is designed for deployment in retail outlets, transportation hubs, educational institutions, and corporate environments, promoting a fully cashless and cardless transaction ecosystem. It enhances operational efficiency by reducing payment time, minimizing human error, and preventing identity theft or fraud. Additionally, the integration of AI-driven analytics enables businesses to track transaction trends and optimize customer experiences. This project demonstrates the potential of combining artificial intelligence, embedded systems, and digital finance technologies to revolutionize the future of payments. By providing a secure, efficient, and user-friendly payment interface, Smart Face Pay contributes to the broader goal of digital transformation and smart economy development. The system represents a scalable and sustainable approach toward the next generation of intelligent payment infrastructure.

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Comparative Study on Self-Compacting Concrete with Partial Replacement of Cement by Fly Ash and GGBS

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Abstract:

Self-Compacting Concrete (SCC) is widely used for repair applications and casting concrete in constrained locations, particularly where access for vibration is limited. SCC exhibits high self-compactability and can fill all types of formworks without requiring vibratory compaction, which is beneficial for historical structures. The use of mineral admixtures, such as fly ash and ground granulated blast furnace slag (GGBS), enhances strength, reduces thermal cracking, improves impermeability, refines pore structure, and increases durability against chemical attacks.

The mix design for M80 grade concrete was performed according to the Indian Standard Code. In addition to cement and fine aggregates, chemical admixtures such as superplasticizers, fly ash, and GGBS were incorporated to improve performance. Compressive strength tests were conducted to evaluate the effectiveness of partial cement replacement by these admixtures in SCC.

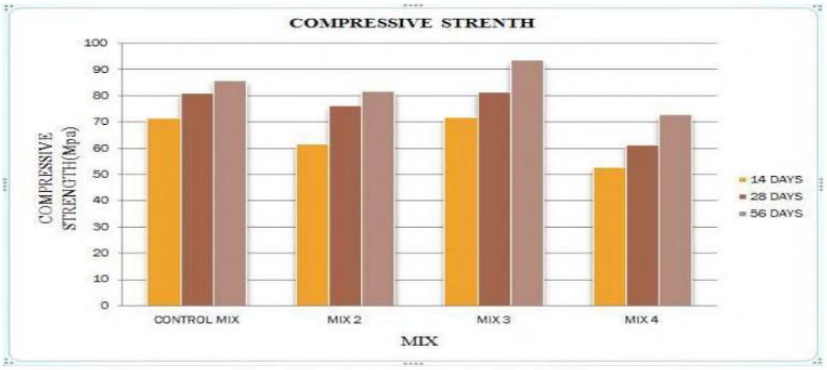

Fig: Comparison of Compressive Test of Cubes

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Stock Price Prediction Using LSTM

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Abstract:

Stock market prediction is a challenging task due to its dynamic, non-linear, and volatile nature. This study proposes an intelligent predictive model using Long Short-Term Memory (LSTM) networks, a variant of Recurrent Neural Networks (RNNs), to forecast future stock prices based on historical data. LSTMs are particularly suited for time-series forecasting, as they capture long-term dependencies and temporal patterns in sequential data.

The system collects and preprocesses stock price data, including open, close, high, low, and volume, from publicly available financial datasets. The data is normalized and split into training and testing sets. The LSTM model is trained to learn patterns and trends from past price movements. Model performance is evaluated using metrics such as Mean Squared Error (MSE) and Root Mean Squared Error (RMSE). Results indicate that the LSTM-based approach provides more accurate and reliable predictions compared to traditional statistical models, making it a valuable tool for investors and financial analysts. Future improvements may include integrating sentiment analysis, technical indicators, or hybrid deep learning architectures to enhance prediction accuracy.

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IoT-Based Bridge Health Monitoring System Using Cloud

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Abstract:

Bridges are critical transportation infrastructures that require continuous health monitoring to ensure public safety. Traditional inspection methods are manual, time-consuming, and prone to human error. This project proposes an IoT-based smart bridge monitoring system using vibration and strain sensors to detect abnormal stress, cracks, and vibration patterns.
Sensor data is transmitted to a microcontroller (e.g., NodeMCU/ESP32), which uploads the readings to a cloud platform such as ThingSpeak or Blynk. When irregularities exceed predefined thresholds, the system sends instant alerts to maintenance authorities via mobile notifications or email. This real-time monitoring facilitates predictive maintenance, reduces manual inspections, and prevents potential bridge failures through timely intervention.

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Real-Time Detection of ASL Alphabets

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Abstract:

The Real-Time Detection of ASL Alphabets project presents a deep learning-based approach to recognizing American Sign Language (ASL) alphabet letters in real time using a custom Convolutional Neural Network (CNN). The system preprocesses images of ASL signs, resizing and augmenting them before training the model. The dataset is split into training and validation sets, with labels one-hot encoded for classification.

After training, the model is deployed for real-time detection via a webcam, where a designated area on the video feed captures the user's hand gestures. The model processes the gesture images and predicts the corresponding ASL letter, which is displayed on the screen. The system supports both single-image predictions and continuous video input, making it suitable for interactive applications that recognize ASL alphabets in real-time scenarios.

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SmartChef: AI-Powered Recipe Generation from Food Images

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Abstract:

In recent years, the integration of artificial intelligence (AI) into the culinary domain has opened new possibilities for intelligent food analysis, personalized cooking assistance, and smart kitchen automation. Despite remarkable progress, generating accurate recipes directly from food images remains a complex challenge due to the high visual variability of dishes and the contextual reasoning required to translate visual features into coherent textual instructions.

This study presents **SmartChef**, an AI-powered system designed to automatically generate complete, step-by-step cooking recipes from food images by leveraging deep learning, natural language processing (NLP), and speech-based interaction. The proposed framework integrates a convolutional neural network (CNN) for robust food image recognition and a transformer-based language model for dynamic recipe generation, including ingredients, preparation steps, and nutritional insights. Furthermore, speech synthesis and recognition modules are incorporated to provide hands-free, interactive assistance, allowing users to communicate with the system via voice commands and receive spoken recipe guidance in real time.

SmartChef was evaluated on a large-scale food dataset and demonstrated high performance in both visual recognition and language generation quality. The system features an intuitive web interface that supports image uploads, recipe previews, and interactive voice-enabled cooking instructions, thereby enhancing accessibility and user engagement. Experimental results affirm that SmartChef effectively bridges visual perception, linguistic intelligence, and auditory interaction, marking a significant advancement in intelligent culinary automation and user-centered AI design.

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Gesture Control Mouse

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Abstract:

Human–computer interaction has evolved toward more intuitive modes of communication. Among these, gestures represent one of the most natural and expressive forms of human interaction. However, vision-based hand gesture recognition remains a challenging task due to the complexity and high degree of freedom in human hand movements.

This project presents a **Gesture Control Mouse** system that enables users to interact with a computer using hand gestures captured through a webcam, eliminating the need for a traditional mouse. The proposed system employs a skin detection algorithm to segment hand regions from the background, followed by contour and convex hull algorithms to identify hand boundaries and detect fingertips. These detected gestures are then mapped to mouse cursor movements and button actions.

Experimental results demonstrate that the system performs effectively in real time, allowing users to navigate and control computer interfaces seamlessly using natural gestures. The implementation showcases the potential of vision-based HCI systems in promoting touchless interaction, offering a cost-effective, hygienic, and accessible alternative to physical input devices.

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Smart Traffic Management System for Ambulances

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Abstract:

In urban environments, traffic congestion poses a major challenge to emergency response systems, especially for ambulances that require rapid and uninterrupted passage. Delays caused by traffic jams can result in critical loss of time, often impacting patient survival rates. To address this issue, this research proposes a Smart Traffic Management System for Ambulances that leverages the power of IoT (Internet of Things), Machine Learning, and Cloud-based communication to prioritize ambulance movement in real-time.

The proposed system utilizes GPS-based ambulance tracking, sensor-equipped traffic signals, and dynamic route optimization algorithms to identify the shortest and least congested path. When an ambulance is detected near an intersection, the system automatically communicates with the traffic control unit to turn the signal green, ensuring a clear passage. Furthermore, the data collected from traffic sensors is analyzed using machine learning models to predict congestion and optimize signal timings proactively.

The prototype demonstrates improved emergency vehicle response time and enhanced traffic flow efficiency. Future work aims to integrate AI-based predictive modeling and 5G-enabled communication for faster response and real-time coordination between multiple ambulances and traffic control centers. This system has the potential to revolutionize emergency response infrastructure and significantly reduce ambulance delays in smart cities.

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An AI-Based Web Application for Prescription Digitization and Medication Reminders in Elderly Care

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Abstract:

Elderly patients managing multiple prescriptions face a higher risk of missing doses and experiencing harmful drug-drug interactions (DDIs). This project creates a web-based prescription and medication reminder system powered by AI, specifically designed for older users. The system digitizes and stores prescriptions using Optical Character Recognition (OCR) and medical Named Entity Recognition (NER). It maps drug data to standardized vocabularies like RxNorm.

A hybrid DDI detection engine combines rule-based checks with machine learning to identify potential interactions and generates clear alerts for caregivers and clinicians. The reminder module provides various notifications, including visual alerts, push notifications, voice prompts, and SMS/phone calls, ensuring accessibility for users with different levels of comfort with technology and any disabilities. Missed-dose detection triggers notifications for caregivers and follows a customizable escalation policy.

To prioritize safety, privacy, and compliance, symptom-based over-the-counter (OTC) suggestions are clearly labeled as non-prescriptive and require clinician validation when activated. The implementation uses modern OCR models, such as TrOCR, and includes explainable machine learning for DDI detection. It also features a senior-friendly user interface (UI) with large buttons and voice-first workflows.

Deliverables include a prototype web application, evaluation of OCR/NER accuracy on anonymized prescriptions, assessment of DDI detection, and user-acceptability testing with elderly participants and caregivers. By integrating AI-driven prescription analysis with reliable reminder systems, the project improves adherence, reduces medication errors, and supports independent living for elderly patients.

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Effect of Peel Milling Tool Path Orientation on Material Removal Rate and Machining Time Using Taguchi Robust Design

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Abstract:

The Peel Milling process has improved in recent decades through advancements in tooling systems, technologies, and control strategies. Tool path orientation has a significant influence on material removal rate, cutting force, tool wear, cutting temperature, and overall part quality. Therefore, an appropriate tool path must be investigated to achieve optimal performance.
Peel milling is an effective strategy for high-speed machining due to its reduced cutting force load and enhanced heat dissipation, which significantly prolongs tool service life. This work aims to increase the material removal rate by varying the tool path orientation of peel milling. The study is divided into two sections: the first section focuses on the development and simulation of peel milling tool paths with various orientations, and the second section analyzes machining time and material removal rate using Taguchi robust design methodology.

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Formulation and Evaluation of Nano-Biofortified Salt for Enhanced Nutrient Absorption in Humans

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Abstract:

Micronutrient malnutrition, also known as "hidden hunger," remains a critical global public health challenge, affecting billions of people, particularly in low- and middle-income countries. Deficiencies in key nutrients such as iron, iodine, zinc, and vitamin D are associated with serious health consequences, including anemia, goiter, impaired cognitive development, compromised immunity, and bone disorders.

This project addresses the need for a sustainable, accessible solution by developing a **biofortified salt formulation** aimed at enhancing nutrient absorption in humans. Salt, as a universally consumed condiment, serves as an ideal vehicle for nutrient delivery. The formulated salt is enriched with essential micronutrients—iron, zinc, iodine, and vitamin B9/B12—and employs **nanoencapsulation** and food-grade polymer carriers to improve the stability of labile nutrients, prevent chemical interactions, and facilitate controlled release during digestion. These strategies ensure maximum bioavailability and palatability while maintaining the organoleptic properties of salt.

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Identifying Taxonomy and Assessing Biodiversity from eDNA Datasets Using AI-Driven Approaches

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Abstract:

Deep-sea ecosystems remain largely uncharted due to logistical difficulties and the absence of comprehensive biological reference databases. Environmental DNA (eDNA) sequencing allows for non-invasive monitoring of biodiversity, but traditional reference-based classification methods are limited in their accuracy and scope.

This project introduces an **AI-driven pipeline** that utilizes deep learning and unsupervised techniques for:

- Direct taxonomic classification of eDNA sequences,
- Identification of new lineages, and
- Evaluation of species abundance from raw eDNA datasets.

The proposed approach accelerates biodiversity surveys, reduces dependence on incomplete databases, and uncovers previously unknown deep-sea species. This enables more effective conservation strategies and resource management.

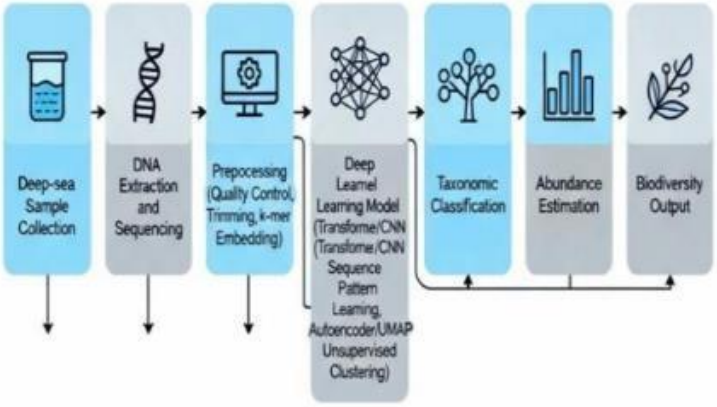

Fig: AI Pipeline of Environmental DNA (eDNA) Biodiversity Analysis

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High-Fidelity Driving Simulation Framework Based on Unreal Engine 5

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Abstract:

This project presents the design and development of a high-speed car racing simulation using Unreal Engine 5 (UE5). The primary objective is to deliver a realistic, engaging, and immersive driving experience that combines advanced vehicle physics, dynamic environments, and AI-driven competition. Vehicle dynamics are modeled using the Chaos Vehicle Physics system, enabling accurate simulation of acceleration, steering, braking, drifting, and collision effects. Visual fidelity is enhanced through UE5's Nanite and Lumen technologies, providing detailed 3D models and realistic global illumination in real time.

Adaptive AI opponents with varying driving strategies are incorporated to provide challenging gameplay. Multiple racing tracks, vehicle customization options, and high-quality sound design further enhance replayability and user engagement. The system is optimized for smooth execution across different hardware configurations, maintaining consistent frame rates without compromising realism.

Results indicate that integrating advanced physics simulation with next-generation rendering technologies establishes an effective platform for modern racing simulations. Future expansions could include multiplayer functionality, dynamic weather and environmental systems, day-night cycles, and virtual reality (VR) integration, further enhancing gameplay depth and player experience.

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Integrating Crowdsourced Reports and Social Media Analytics for Real-Time Ocean Hazard Monitoring

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Abstract:

India's extensive coastline is highly susceptible to various ocean-related hazards such as tsunamis, storm surges, high waves, and coastal flooding. The Indian National Centre for Ocean Information Services (INCOIS), under the Ministry of Earth Sciences, provides early warnings and ocean advisory services to safeguard coastal communities. However, current systems often lack real-time ground-level validation and citizen participation, resulting in delayed or incomplete situational awareness.

This project proposes a unified, crowdsourced disaster information platform that integrates citizen-generated field reports and social media analytics to enhance coastal hazard monitoring and response. The system includes a mobile and web-based application allowing citizens to submit geotagged observations with images or videos, which are visualized on an interactive map-based dashboard alongside real-time social media trends. Natural Language Processing (NLP) techniques are used to extract and classify hazard-related discussions, sentiment, and engagement from platforms such as Twitter and Facebook.

Dynamic hotspot visualization enables disaster managers to quickly identify areas of concern and allocate resources efficiently. The solution supports multilingual input and offline data collection, making it accessible to diverse coastal populations. By combining crowdsourced intelligence with official early warning systems, the platform strengthens disaster preparedness, improves response coordination, and enhances community resilience against ocean-based hazards.

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3. Hossain, P. S., et al. "Enhancing Taxonomic Categorization of DNA Sequences via Deep Learning," PMC12109572, 2023.

DreamCreators – A Platform for Emerging Filmmakers and Producers

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Abstract:

The modern film industry is a dynamic and rapidly evolving field, offering immense opportunities for creativity and storytelling. However, many young and talented filmmakers face difficulties in securing funding, connecting with producers, and finding platforms to showcase their ideas.

To address this issue, **FilmLaunch** is proposed as a web-based platform that acts as a bridge between aspiring filmmakers and industry professionals. The system enables users to upload their creative projects, seek crowdfunding, and connect with interested producers, investors, and businesspersons who are looking to produce or invest in film projects. The platform integrates features of crowdfunding, networking, and content promotion, creating a unified digital ecosystem for the film industry.

This paper presents the design, development, and implementation of FilmLaunch, highlighting its architecture, database design, advantages, and future scope.

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EduBox – Offline Learning Cube for No-Internet Villages

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Abstract:

EduBox is a portable, offline educational device designed to deliver digital learning in rural and remote areas where internet and electricity access are limited or non-existent. Built around a Raspberry Pi, EduBox stores multilingual educational content—including videos, notes, and quizzes—and creates its own local Wi-Fi network, allowing students to access materials on smartphones, tablets, or laptops without internet connectivity.

The system is energy-efficient, operating on rechargeable batteries or solar power, making it ideal for deployment in infrastructure-poor regions. EduBox supports easy content updates via USB or SD card, ensuring that learning materials remain current and relevant. The accompanying Test Plan outlines the strategy for validating EduBox's functional and non-functional requirements, focusing on reliability, usability, and performance under offline conditions. By bridging the digital divide, EduBox empowers students and educators with inclusive, self-paced learning opportunities, promoting equitable access to quality education across underserved communities.

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A Smart Traffic Control and Drunk Driving Prevention Using Environmental and Biometric Sensors

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Abstract:

This project proposes an integrated dual-safety framework aimed at revolutionizing road safety through adaptive and preventive technologies. The system leverages real-time environmental data to dynamically modulate vehicular speed thresholds, responding instantaneously to adverse meteorological conditions such as precipitation, reduced visibility, or high winds.

Concurrently, it incorporates an automated impairment detection mechanism that monitors driver sobriety, intervening to halt vehicle operation upon identifying alcohol presence beyond permissible limits. By synthesizing these innovations—weather-responsive speed governance and alcohol-triggered vehicle immobilization—the framework seeks to mitigate risks associated with hazardous driving conditions and impaired operation.

The synergy of IoT-enabled sensors, adaptive signage, and embedded vehicle control systems forms a cohesive safety ecosystem with applications spanning traffic management, autonomous vehicle integration, and smart urban infrastructure. This approach not only addresses prevalent causes of road incidents but also lays a foundation for scalable advancements in intelligent transportation systems.

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Audio to Sign Language Converter

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Abstract:

Communication between hearing and speech-impaired individuals and the rest of society remains a significant challenge. This project, Audio to Sign Language Converter, aims to bridge this communication gap by translating spoken language into corresponding sign language gestures in real time.

The system captures audio input, processes it using speech recognition techniques to convert the sound into text, and then maps each recognized word or phrase to its equivalent sign language representation. The signs are displayed using 2D or 3D animated models or graphical hand gesture images, ensuring clear and understandable visual output for hearing-impaired users.

By integrating natural language processing (NLP) and gesture animation technology, this converter enhances accessibility and inclusivity for individuals with hearing or speech disabilities. The proposed system can be extended to support multiple languages and integrated into mobile or web applications to promote seamless communication in education, healthcare, and public service sectors.

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Development of Paper Pulp from Sisal and Banana Fiber with Rice Straw

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Abstract:

The development of paper pulp from sisal, banana fiber, and rice straw utilizes agricultural residues as an alternative to conventional wood-based pulp. The objective of the project is to promote sustainable and eco-friendly handmade paper production using locally available natural fibers.

The fibers were extracted, cleaned, treated, and blended in different proportions to form pulp sheets. The fabricated paper samples were tested for weight, thickness, and bulk density to evaluate their physical properties. The results showed that the sample weights ranged from 2.5 g to 5 g, with thickness varying between 0.25 mm and 0.31 mm. The bulk density of the samples ranged from 9.25 g/cm³ (N4-1) to 17.85 g/cm³ (N6-2), indicating that fiber composition and sheet compactness influence the strength and quality of paper.

Samples with higher sisal and banana fiber content exhibited better bonding and uniform surface texture compared to those with more rice straw. The findings confirm that these agricultural wastes can be effectively utilized for sustainable paper pulp production, reducing environmental impact, deforestation, and promoting value addition to agro-residues.

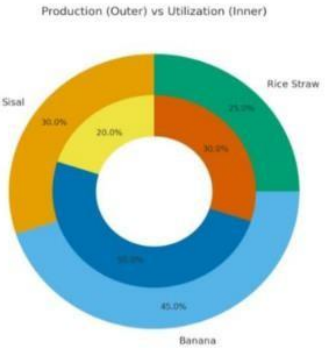

Fig: Production And Utilization Of Raw Materials

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Soil Moisture and Crop Management using Machine Learning and Embedded System

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Abstract:

Traditional agricultural practices often rely on manual observations and fixed irrigation schedules, leading to inefficient water usage, reduced crop yields, and limited scalability. Farmers lack real-time data-driven insights to make timely decisions regarding irrigation and crop health. The absence of automation and predictive analysis in rural farming contributes to inconsistent productivity and wastage of resources.

This paper proposes an intelligent soil moisture and crop management system that uses embedded systems to collect environmental data such as soil moisture, temperature, and humidity, and employs machine learning models to analyze this data and predict irrigation needs. The system improves water usage efficiency, promotes sustainable farming practices, and reduces human efforts.

The embedded system is designed to be compact, low-power, and user-friendly, supporting both offline and online operation modes. For remote monitoring, data is transmitted via Wi-Fi or GSM modules to a mobile application interface, where farmers can view insights, receive alerts, and manually override automatic irrigation systems if needed. The methodology integrates precision agriculture techniques through advanced agricultural sensors, showcasing how AI and IoT technologies can transform traditional agriculture into a smarter and resource-efficient system.

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Smart Government Schemes

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Abstract:

In India, government welfare schemes aim to uplift citizens by providing financial assistance, employment opportunities, healthcare, and education. However, many eligible beneficiaries remain unaware of or unable to access these schemes due to poor information dissemination and manual application processes. To address this gap, we propose **Smart Government Schemes (SGS)** — a unified digital platform designed to integrate, simplify, and automate access to government welfare schemes.

The system allows users to search for schemes by category, eligibility, or demographics, and apply directly through a secure online interface. It also enables authorities to monitor scheme performance and ensure transparency. The project focuses on accessibility, automation, and inclusivity to strengthen India's digital governance ecosystem.

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Railway Track Crack Prediction using Acoustic Waves

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Abstract:

Railway infrastructure safety relies heavily on detecting track defects early. Traditional methods like visual and ultrasonic inspections, while useful, can be slow and do not offer real-time monitoring. This paper introduces a new way to predict railway track cracks by using acoustic wave analysis and machine learning. Acoustic emission sensors are placed along the rail to continuously capture wave signals created by interactions between train wheels and changes in the track's structure. The captured signals undergo preprocessing that includes noise filtering and wavelet transforms to extract features related to time and frequency. These features are classified using a deep learning model to distinguish normal and defective rail conditions. Experiments on laboratory test tracks and field data show that this method can accurately detect early-stage cracks, even in noisy environments. The system allows for real-time, non-destructive, and cost-effective monitoring. It provides a promising solution for predictive maintenance and enhances railway safety.

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Development of a Compact Solar-Assisted Cotton Harvesting Unit for Sustainable Farm Mechanization

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Abstract:

The design and fabrication of a solar-powered cotton picking machine aim to provide an efficient, eco-friendly, and low-cost solution for agricultural harvesting. Traditional cotton picking is labor-intensive, time-consuming, and often results in reduced productivity. To overcome these challenges, this project integrates solar energy with mechanical design. The system consists of a solar panel that charges a battery, which powers a DC motor for the picking mechanism. The motor drives a rotating disc with attached picking elements that pluck cotton fibers from the bolls and collect them in a container. The frame is fabricated using sheet metal, and wheels are provided for easy mobility in the field. This solar-based machine reduces dependence on manual labor and fossil fuels while enhancing harvesting efficiency. Its portability, low maintenance, and renewable energy utilization make it suitable for small and medium scale farmers, contributing to sustainable and modernized agricultural practices.

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Study on Labour and Material Management in Construction Industry

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Abstract:

Material management is a vital part of the construction business. Companies must understand how proper material management strategies affect the efficiency of project execution. A well-executed materials management program ensures the timely flow of goods and equipment to the job site, allowing for better workface planning, enhanced worker productivity, more efficient scheduling, and lower project costs. Material management functions include planning and material take-off, vendor evaluation and selection, purchasing, expenditure, shipping, material receiving, warehousing and inventory, and material distribution. This project proposes a material management scheme for a building project and includes an industry survey to determine various approaches for construction material management.

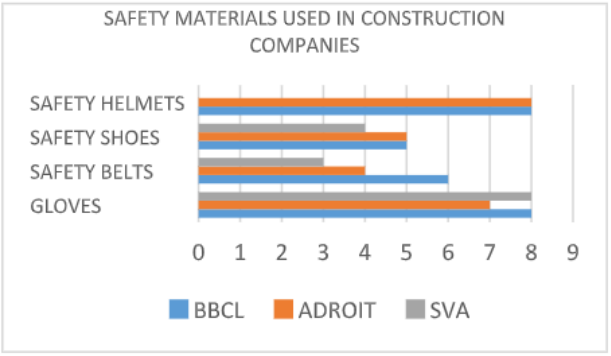

Fig. Safety materials used in construction companies

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Utilization of Eggshell Waste and Rice Starch for the Production of Biodegradable Pot

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Abstract:

This project focuses on developing an eco-friendly and biodegradable pot using eggshell waste and rice starch. Eggshells, rich in calcium carbonate, enhance the strength and rigidity of the pot, while rice starch serves as a natural binder providing flexibility. The materials were mixed, molded, and dried to form biodegradable pots, which were later tested for water absorption, compressive strength, and biodegradability. The results showed that the pots were durable, lightweight, and decomposed easily in soil without leaving harmful residues. This project promotes waste utilization, environmental protection, and provides a sustainable alternative to plastic pots commonly used in agriculture and decoration. The successful production of these pots demonstrates an innovative method to convert household waste into valuable eco-products, supporting sustainable development and encouraging the use of biodegradable materials in daily life.

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EchoHands: A Smart Assistive System for Sign-to-Speech Communication

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Abstract:

Communication barriers between hearing-impaired and hearing individuals pose serious issues in education, healthcare, and social integration. Traditional solutions such as human interpreters or manual text-based systems are typically costly, require constant availability, and slow down natural real-time conversation. To bridge this gap, we introduce EchoHands: A Smart Assistive System for Sign-to-Speech Communication. EchoHands uses wearable sensors and gesture recognition powered by machine learning to translate sign language gestures into synthesized speech in real time. Recorded gestures are analyzed by trained models that translate them into their linguistic equivalents, which are then synthesized into spoken words. The system is optimized for high accuracy (with over 90% recognition rate) and low latency (less than 200 ms), making it efficient and feasible for deployment. Experimental tests with common sign language sentences show that EchoHands effectively converts gestures into natural, legible speech, enhancing both communication fluency and response time. This attests to its viability as a portable, accessible, and affordable aid. Thus, EchoHands provides an extensible solution to overcome communication gaps, enabling individuals with hearing impairments to freely interact in day-to-day conversations.

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3. Liu, D., Zhang, Y., & Chen, L. (2018). Eggshell waste as a calcium source for polymer composites. Journal of Environmental Chemical Engineering.
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Sensor Based Shopping Assistance System

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Abstract:

The project *Sensor-Based Shopping Assistance System for Persons with Disabilities (PwDs)* aims to empower individuals with physical or speech impairments by enabling independent shopping in physical retail environments. Using an eye-blink sensor integrated with Morse code translation, the system converts simple eye movements into text commands that interact with a shopping interface. An Android application is developed to provide product categories, item selection, and billing support, allowing users to navigate and complete purchases without external assistance. This approach offers a low-cost and practical alternative to expensive technologies such as brain–computer interfaces or advanced eye-tracking systems, making it especially suitable for adoption in developing regions. Beyond shopping, the system is versatile and can be extended to libraries, pharmacies, hospitals, and food courts, ensuring accessibility across multiple domains. By promoting independence, inclusivity, and dignity for PwDs, the project aligns with the Accessible India Campaign (Sugamya Bharat Abhiyan) and the UN Sustainable Development Goals (SDGs). It also holds potential for integration into smart retail and healthcare industries, bridging the gap between assistive technology and everyday usability.

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PhytoTrack AI: Modern Inventory & Billing Solution for Small Scale Local Shops

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Abstract:

Small-scale local shops play a crucial role in supporting neighborhood economies, yet they often face challenges in manual stock tracking, inaccurate billing, and limited access to modern technology. *PhytoTrack AI* addresses these issues by providing an intelligent, scalable, and user-friendly inventory and billing system built using the MERN stack (MongoDB, Express.js, React.js, Node.js) integrated with AI-driven analytics. The system automates inventory management with barcode/QR code scanning, enabling real-time stock updates and reducing manual errors. It also generates GST-compliant invoices, ensuring regulatory accuracy while improving billing efficiency. Through an AI-powered demand prediction module, implemented via a Python-based Flask microservice, PhytoTrack AI forecasts product demand trends using historical sales data to prevent overstock or stockouts. A bilingual interface (Tamil and English) enhances accessibility for local shop owners, and Twilio-based notifications alert users about low-stock items and promotional updates. The proposed solution improves operational efficiency, supports informed decision-making, and bridges the gap between traditional retail practices and modern digital transformation. Overall, PhytoTrack AI demonstrates how affordable, AI-enabled solutions can empower local businesses to compete effectively in today's data-driven retail landscape.

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MedSegNet: Self-Supervised Medical Image Segmentation

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Abstract:

Medical image segmentation plays a vital role in the diagnosis, treatment planning, and monitoring of various diseases. However, most existing deep learning methods rely heavily on large annotated datasets, which are often difficult and costly to obtain in the medical domain. To overcome this limitation, *MedSegNet* employs a Self-Supervised Learning (SSL) approach to achieve efficient medical image segmentation using limited labeled data. The model leverages an autoencoder-based SSL framework for pretraining on unlabeled medical images, learning strong visual representations. These pretrained features are then fine-tuned using a small number of labeled scans for precise segmentation.

To ensure accessibility and real-world usability, the trained model is integrated into a Java Full Stack Web Application. The backend, built with Spring Boot, communicates with a Python-based AI service for inference, while the frontend (developed using React.js) enables users to upload scans, visualize segmented results, and download reports. A database layer ensures secure user management and storage of processed data.

Experimental evaluation using open-source medical datasets demonstrates improved accuracy and segmentation quality with minimal labeled samples. The proposed system provides a scalable and cost-effective solution for hospitals and researchers, reducing dependency on large-scale annotations. Future enhancements include extending support for multi-modal imaging (CT, MRI, X-ray) and developing a mobile version for clinical deployment.

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Skill Based Career Path Prediction

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Abstract:

This project presents the development and implementation of an AI-Based Career Path Prediction System designed to provide personalized and data-driven guidance to students. The system addresses the critical problem of misalignment between a student's educational background and the demands of the modern job market, often leading to career confusion and dissatisfaction.

Our approach leverages Machine Learning (ML) classification techniques to analyze a holistic profile of each student. The primary input features include two main categories:

- **Academic Profile:** Quantitative data such as scores in various subjects (e.g., Mathematics, Programming, Designing), cumulative GPA, and specific course/stream choices.
- **Skill Profile:** Qualitative and categorical data including proficiency in technical skills (e.g., Python, Data Structures, CAD), soft skills (e.g., leadership, teamwork, communication), and involvement in extracurricular activities or certifications.

The core of the system is a Random Forest Classifier, chosen for its high accuracy, robustness against complex and varied data types, and ability to identify the most significant predictive features (feature importance). It also includes a user-friendly UI/UX module—a web application where students can input their profile details and receive a ranked list of recommended career paths, along with a probability score for each suggestion.

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Flight Price Prediction Web-Based Platform: Leveraging Generative AI for Real-Time Airfare Forecasting

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Abstract:

The aviation industry faces challenges in accurately and promptly predicting flight fares due to its dynamic nature. Factors such as demand fluctuations, fuel costs, and route complexities significantly influence pricing. This study proposes a novel approach using generative artificial intelligence (GAI) models to forecast airfares in real-time. The framework integrates generative models, deep learning architectures, and historical pricing data to enhance predictive accuracy. By leveraging GAI within a web-based platform, the system captures temporal fluctuations and patterns present in historical airline data, allowing the model to respond effectively to dynamic market conditions. Neural networks are employed to identify inconsistencies and extract critical information influencing airfare, such as market volatility, route correlations, and seasonal trends.

The proposed approach emphasizes precise short-term fare predictions, facilitating timely decision-making for airlines, travel agents, and customers. The web-based interface ensures smooth interaction with live data streams and supports real-time updates, demonstrating adaptability to changing market conditions. This solution provides stakeholders with actionable insights and accurate forecasts to optimize planning and revenue management.

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Integrated Deep Learning Frameworks for Early Prediction of Alzheimer's Disease

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Abstract:

Alzheimer's disease (AD) is a primary neurodegenerative disorder primarily affecting elderly individuals. With over 55 million people living with dementia in 2020, projections estimate this number to rise to 78 million in 2030 and 139 million in 2050, emphasizing the urgent need for early detection, particularly in high elderly population countries like India and China. Early diagnosis of AD can reduce disease progression, improve therapeutic outcomes, and enable timely intervention.

The proposed framework integrates Deep Q-Networks (DQN) with Long Short-Term Memory (LSTM) models to treat diagnosis as a sequential decision problem, and a Deep Belief Network (DBN) for hierarchical spatial feature extraction combined with LSTM for modeling longitudinal changes. Preprocessing steps include bias-field correction, skull stripping, normalization, and data augmentation, with k-fold cross-validation used for model evaluation. The system classifies normal, mild cognitive impairment, and AD cases, demonstrating superior accuracy and sensitivity in early-stage detection compared to CNN/RNN baselines. Hybrid deep learning models (DBN+LSTM and DQN+LSTM) improve classification performance across all stages, enhance early-stage sensitivity using balanced loss functions, and employ ROC-AUC monitoring. This approach provides interpretable, reliable, and clinician-oriented diagnostic support by modeling both spatial and temporal brain changes for timely AD screening.

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Powered Intrusion Prevention System for Advanced Cyber Threat Protection

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Abstract:

The integration of Information and Communications Technology (ICT) has made modern power distribution systems, or smart grids, easier to monitor and control remotely. However, this enhanced connectivity also makes them more susceptible to cyberattacks. Current research on intrusion detection for power grids has primarily concentrated on security at the Supervisory Control and Data Acquisition (SCADA) and single-node levels, largely ignoring the threat of coordinated attacks across multiple nodes.

To address this gap, this paper introduces a novel multi-agent system for intrusion prevention at the distribution system level. The proposed approach was simulated on the IEEE 13-Node Test Feeder and compared with existing techniques. The findings validate the effectiveness of the system in protecting the distribution grid against cyber intrusions, offering a robust solution for advanced threat detection and prevention.

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Investigation of the Mechanical Properties of Carbon Pistons for Internal Combustion (IC) Engines

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Abstract:

This study delves into the investigation of the mechanical properties of carbon pistons and their suitability for internal combustion (IC) engines. The research aims to analyze key parameters that differentiate carbon pistons from traditional aluminum pistons. Comparative analysis is conducted under various conditions, encompassing static and dynamic equilibrium, as well as thermal behavior through ANSYS software simulations.

The overarching objective is to propose carbon pistons as an innovative material to address emissions reduction and enhance engine longevity. The introduction of carbon pistons also holds potential for downsizing engines, while their higher density characteristics enable the achievement of significantly higher speeds. The study provides a comprehensive exploration of carbon piston performance under distinct conditions, including heavy loading and elevated temperatures. Additionally, the advantages and applications of carbon pistons are highlighted in contrast to conventional aluminum alloy pistons. Through this investigation, we shed light on the transformative potential of carbon pistons in advancing IC engine technology.

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Coconut Fibre Reinforced with Wood Charcoal, Egg Shell Filler Powder with Polyester Resin Composite for Automotive Applications

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Abstract:

The mechanical properties of polyester matrix composites reinforced with coir fibres have been investigated in this paper. A series of mechanical properties such as tensile strength, flexural strength, and impact strength of the material were calculated in this study. In addition, the fracture toughness of the composites is also investigated.

With the use of compression modulating methods, these fibers were incorporated into matrix resin at different weight percentages (20%, 30%, 40%) in order to keep the percentage of the total weight of fibers constant. According to the results of the evaluation, the 30:70 composite has a higher mechanical property than the other combinations of materials when compared to the other combinations. By integrating both fibers in a polyester resin matrix, there are signs that the mechanical properties of the resin will be improved in comparison to pure polyester resin when the fibers are integrated in a matrix.

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Hybrid Landslide Early Warning System: Integrating LoRa Sensor Mesh Networks with Real-Time Weather Forecasting APIs

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Abstract:

Landslides are a natural hazard in many hilly and mountainous terrains, often leading to significant loss of life and damage to infrastructure. Early detection of conditions that may lead to landslides can help in implementing timely preventive measures.

This project focuses on developing a landslide detection system consisting of a transmitter unit deployed at the monitoring site and a ground station for data reception and display. The transmitter unit comprises an ESP32 microcontroller and an Arduino microcontroller for processing and control functions. It integrates various sensors to measure critical parameters: a soil moisture sensor to monitor water content in the soil, a rain sensor to track rainfall levels, a DHT11 sensor to measure temperature and humidity, and a vibration sensor to detect ground movements. An OLED display is provided for viewing the sensor readings locally at the site. The unit is powered by a 3.7V Li-Po 1500mAh battery, which is maintained through a small solar panel for continuous operation. A TP4056 charging module Battery Management System (BMS) ensures safe and efficient charging. A buzzer provides immediate on-site alerts when threshold conditions are exceeded. The transmitter sends the collected sensor data to the ground station via a LoRa communication link.

The ground station consists of an ESP32 microcontroller connected to a LoRa receiver module, powered by a Li-Po battery. It displays the incoming sensor data on an OLED display for real-time monitoring. By combining multiple sensors, reliable wireless communication via LoRa, and solar-assisted power, this system provides a practical solution for monitoring landslide-prone locations and supporting timely alerts.

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AI-Driven Wilderness Search and Rescue Using Thermal Imaging

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Abstract:

In India, wilderness search and rescue (WiSAR) operations are often hampered by challenging terrain, low-visibility conditions, and a lack of efficient, real-time detection systems. According to the National Disaster Management Authority (NDMA), India witnesses an average of 50,000 missing person cases annually, with a significant portion occurring in remote or forested areas. Of these, more than 30% remain unresolved for extended periods, highlighting the urgent need for rapid, effective search methodologies. Traditional methods often require several days to locate missing individuals, with a success rate significantly impacted by environmental factors like dense forests, poor weather, and limited human resources.

This work proposes an AI-driven system that integrates thermal imaging and acoustic sensing to autonomously locate human presence in challenging environments. Leveraging a Raspberry Pi as the processing hub, an MLX90640 thermal camera for heat signature detection, and a microphone module for real-time audio anomaly analysis, the system employs lightweight machine learning models to identify human-related anomalies based on thermal and sound data. Detection outcomes are transmitted to an autonomous ground vehicle (AGV), controlled via an Arduino/ESP32 platform, enabling autonomous navigation through terrain using ultrasonic sensors for obstacle avoidance. Upon detecting an anomaly, the AGV can reorient and approach the source for closer inspection.

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Medicine Recommendation System

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Abstract:

Access to affordable and easily available medicines remains one of the biggest challenges in modern healthcare. Patients and healthcare professionals often struggle when specific prescription brands are unavailable or too costly, leading to treatment delays and financial strain.

To tackle this problem, the Medicine Recommendation and Substitution System has been created as a smart, data-driven tool that suggests suitable alternative medicines based on formulation, dosage, and active ingredients. The system uses a well-organized and scalable database containing extensive drug-related information, including manufacturers, generic and brand names, price comparisons, and dosage forms. When a user enters a medicine name, the system analyzes its attributes and produces a ranked list of substitute medications with similar therapeutic effects.

This recommendation process helps users make informed and cost-effective choices without sacrificing treatment quality. Additionally, the system's modular design allows for easy addition of features like barcode scanning for medicine identification, real-time pharmacy stock checking, and alerts for drug interactions, enhancing patient safety. By bridging the gap between availability, affordability, and accessibility, the system supports patients and helps pharmacists and healthcare providers maintain a steady medication supply.

In summary, the proposed system demonstrates the potential of smart recommendation technologies in healthcare to promote affordability, transparency, and convenience. It serves as a scalable model that can be further enhanced through artificial intelligence and mobile app integration, aiming to create a fairer and more efficient healthcare system.

Fig. Graphical Abstract of the Medicine Recommendation System

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Stream OS: Real-Time Image Frame Processing

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Abstract:

The deployment of modern AI-driven video analytics in developing countries is severely hampered by a pervasive lack of adequate computational power. To bridge this gap, this study investigates and quantifies the benefits of several key optimization techniques for video stream processing on resource-limited devices.

We explore methods such as strategic frame skipping, multi-threaded parallel processing, and intelligent buffering and memory optimization. The results showcase a powerful balance between performance and resource use, confirming substantial improvements in both FPS and memory footprint. By enabling high-efficiency video analysis, our methodology directly supports the establishment of reliable, real-time surveillance and monitoring systems that are essential for security and development in resource-constrained settings.

This work paves the way for the effective deployment of sophisticated AI-driven video analysis, making real-time monitoring and alert systems a practical reality in environments where resources are scarcest.

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Face Recognition Based Attendance System Using OpenCV

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Abstract:

Attendance systems are very important in schools and colleges. Manual attendance systems face several difficulties, such as lower accuracy and high effort for maintenance. Using face recognition techniques, the accuracy of attendance management can be significantly improved, and the process becomes faster than traditional methods.

Existing systems include face recognition using IoT, PIR sensors, and other hardware-based approaches, which may require careful maintenance to avoid damage. To overcome these challenges, this project implements a system using the Haar Cascade Algorithm, which provides high accuracy for face detection. The system captures images from a distance of 50–70 cm and creates a graphical user interface to manage dataset creation, model training, and recognition in a single click. Recognized faces display the student's name and roll number, which are automatically recorded in the attendance sheet along with the time and date.

This system improves efficiency, accuracy, and automation in attendance tracking for educational institutions.

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Covert Channel Detection in ICMP Protocol using Machine Learning

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Abstract:

Securing modern networks requires not only detecting overt attacks but also identifying hidden communication channels embedded in legitimate protocols. The Internet Control Message Protocol (ICMP), commonly used for diagnostics such as ping and error reporting, has been exploited by attackers to establish covert channels for command-and-control operations and data exfiltration. These covert channels are difficult to detect using traditional rule-based systems due to their similarity to normal traffic patterns.

This project proposes a machine learning-based detection system to identify covert communication within ICMP traffic. A dataset of ICMP packets was created containing both normal and covert samples, with features such as Time to Live (TTL), packet size, payload length, inter-arrival timing, and ASCII content ratio. Five machine learning algorithms — Decision Tree, Random Forest, Logistic Regression, Support Vector Machine, and XGBoost — were trained and evaluated. Among these, the Random Forest model achieved the highest accuracy of 98%, outperforming other models.

The trained model was integrated into a real-time detection framework capable of capturing live ICMP packets, extracting relevant features, and classifying them dynamically. When covert communication is detected, the system immediately raises an alert, while legitimate messages are passed as safe. Experimental results demonstrate that the proposed system significantly enhances detection accuracy compared to traditional methods and provides resilience against timing-based covert communication. This approach effectively strengthens network security by preventing ICMP misuse as a covert communication channel.

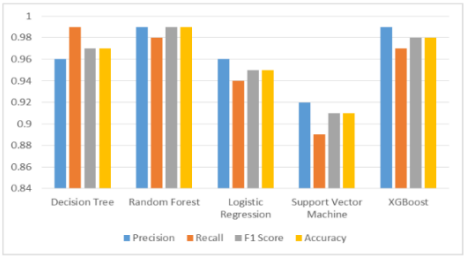

Fig. Performance comparison of ML algorithms for ICMP covert channel detection

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4.

Bio-Template Synthesis of Calcium Oxide from Banana Blossom Residue for Efficient Fluoride Removal in Water Treatment

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Abstract:

Water contamination, particularly by fluoride, poses severe health and environmental risks, necessitating the development of sustainable and cost-effective defluorination technologies. This study presents the **green synthesis of calcium oxide (CaO) nanoparticles** using banana blossom residue (calyx) as a bio-template for efficient fluoride removal from water. The synthesis process involved calcium chloride ($CaCl_2$) and sodium hydroxide (NaOH) as precursors, followed by calcination at 800°C to yield highly pure CaO nanoparticles.

The synthesized nanoparticles were characterized through **Fourier-Transform Infrared Spectroscopy (FTIR)**, **Field Emission Scanning Electron Microscopy with Energy Dispersive Spectroscopy (FESEM-EDS)**, **Ultraviolet-Visible (UV-Vis) spectroscopy**, and **fluorescence analysis** to confirm their morphology and purity. The CaO material was tested for its fluoride adsorption capacity in a 2-ppm fluoride solution at pH 7–8, showing significant removal efficiency using a multiphotometer-based analysis.

This ecofriendly synthesis approach promotes waste valorization by utilizing agricultural residues and provides a sustainable pathway for water purification. Ongoing studies aim to optimize batch adsorption parameters and evaluate kinetics models to enhance fluoride removal efficiency in real-world water treatment applications.

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Deep Learning-Based Real-Time Traffic Prediction on Vehicular Edge Computing Platforms

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Abstract:

The rapid growth of smart transportation systems has led to an increased demand for accurate and real-time traffic prediction to ensure efficient vehicular movement and minimize congestion. Traditional cloud-based traffic prediction systems suffer from high latency and limited scalability when processing continuous data streams from multiple vehicles. To address these challenges, this study proposes a **deep learning-based real-time traffic prediction model** deployed on **vehicular edge computing platforms**. The system leverages **Long Short-Term Memory (LSTM)** and **Convolutional Neural Network (CNN)** architectures for temporal and spatial feature extraction from live vehicular sensor data, GPS coordinates, and environmental parameters.

By processing data at the edge — closer to the source — the model significantly reduces transmission delay and bandwidth consumption, enabling low-latency prediction and adaptive traffic control. Experimental evaluation using benchmark datasets such as **METR-LA** and **PEMS-BAY** demonstrated that the proposed edge-based deep learning approach achieves up to **27% reduction in latency** and **15% improvement in prediction accuracy** compared to centralized cloud models. This work highlights the potential of integrating **vehicular edge computing** and **AI-driven prediction models** for intelligent traffic management and sustainable urban mobility.

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An Intelligent Solar-Powered Water Distribution and Purification System Employing IoT and AI

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Abstract:

In rural and isolated areas, the shortage of clean water persists due to unstable power supplies, inadequate purification systems, and the absence of advanced monitoring mechanisms. This project proposes an **AI and IoT-enabled Smart Solar-Powered Water Purification and Multi-Mode Distribution System with Self-Cleaning Filters**, which integrates predictive intelligence, automation, and renewable energy to ensure efficient water management. The system utilizes solar energy for uninterrupted off-grid operation, while an AI algorithm predicts variations in water quality and dynamically optimizes purification stages. A self-cleaning UV-assisted filtration unit enhances durability and minimizes manual maintenance. Through Internet of Things (IoT) connectivity, real-time data on water quality, flow rate, and system health are transmitted to a centralized cloud dashboard for monitoring and analytics. The multi-mode distribution module features manual tap control, RFID-based prepaid access, and automated tank refilling to ensure equitable and waste-free water distribution. This innovation demonstrates how self-maintenance filtration, IoT-based monitoring, and AI-driven predictive control can create an intelligent, autonomous, and sustainable clean-water solution for rural and off-grid regions. Future developments aim to integrate deep learning analytics and blockchain-enabled usage tracking to enhance transparency and governance in water management.

Fig. Block diagram of the proposed AI and IoT-enabled solar-powered water purification and distribution system

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Edge-Enabled Autonomous Vehicle Navigation Using Convolutional Neural Networks

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Abstract:

The evolution of autonomous vehicles has brought forth the need for real-time decision-making systems capable of operating in dynamic and uncertain environments. However, reliance on cloud-based processing introduces latency, bandwidth limitations, and connectivity dependency that hinder immediate navigation responses. To address these issues, this study presents an **Edge-Enabled Autonomous Vehicle Navigation System** that utilizes **Convolutional Neural Networks (CNNs)** for on-device perception and path decision-making. The proposed system integrates edge computing with advanced image processing techniques to perform tasks such as **lane detection, obstacle avoidance, and traffic sign recognition** directly on edge nodes equipped with GPUs or high-performance microcontrollers.

The CNN model was trained on a combination of the **Udacity Self-Driving Car** and **KITTI Vision** datasets to enhance accuracy under diverse lighting and environmental conditions. Experimental results show that the edge-enabled CNN model achieved a **32% reduction in decision latency** and **18% improvement in real-time frame processing rate** compared to traditional cloud-assisted architectures. This research demonstrates that deploying CNN-based navigation models on vehicular edge platforms significantly improves response time, reliability, and safety in autonomous driving systems.

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Federated Deep Learning for Secure and Low-Latency Vehicular Edge Computing

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Abstract:

The rapid proliferation of connected and autonomous vehicles demands on-board intelligence that is both privacy-preserving and able to meet strict latency requirements. Centralized training of deep learning models is impractical in vehicular ecosystems due to bandwidth constraints, sensitive user data, and high round-trip delays. This work presents a **Federated Deep Learning (FDL)** framework tailored for Vehicular Edge Computing (VEC) that enables collaborative model training across vehicles and nearby edge servers without sharing raw data. The proposed architecture deploys lightweight client models on vehicles and more capable aggregators at roadside edge nodes; it combines secure aggregation, differential privacy, and communication-efficient model compression to protect data confidentiality while reducing transmission overhead. To further lower response time, we incorporate asynchronous update schemes and prioritized model update scheduling based on vehicle mobility and network conditions. A hybrid loss-aware compression technique preserves model accuracy under aggressive communication budgets. Extensive simulations on vehicular benchmark datasets and a VEC testbed show that the FDL framework achieves comparable accuracy to centralized training while reducing uplink communication by over 60% and end-to-end inference latency by 30–45% under realistic network scenarios. Additionally, security analyses indicate robustness against honest-but-curious aggregators and gradient inversion attacks when differential privacy parameters are properly tuned. The proposed FDL solution demonstrates a practical path toward secure, low-latency, and scalable edge intelligence for next-generation intelligent transportation systems.

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DL-Powered Vehicle-to-Everything (V2X) Communication Optimization at the Edge

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Abstract:

Vehicle-to-Everything (V2X) communication is a cornerstone of intelligent transportation systems, enabling vehicles to interact with infrastructure, pedestrians, and other vehicles to improve road safety and traffic efficiency. However, conventional V2X communication strategies face challenges in dynamic vehicular environments, including high latency, network congestion, and unreliable message delivery. This study proposes a **Deep Learning (DL)-powered edge-based V2X communication optimization framework** that leverages vehicular edge nodes to process real-time data and optimize message routing and resource allocation. The system employs recurrent neural networks (RNN) and reinforcement learning techniques to predict vehicular mobility patterns, allocate communication channels dynamically, and reduce network contention. By distributing computation at edge servers near the vehicles, the framework minimizes latency while maintaining scalability and robustness. Simulation results demonstrate significant improvements in throughput, packet delivery ratio, and latency compared to traditional centralized or heuristic-based approaches. The proposed approach highlights the potential of integrating DL with edge intelligence for reliable, low-latency, and adaptive V2X communication, paving the way for safer and more efficient connected vehicular networks.

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Exploration of Sesame Lignans in Functional Food Design for Preventive Care of Musculoskeletal Disorders

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Abstract:

Musculoskeletal disorders (MSDs), including osteoarthritis, rheumatoid arthritis, gout, and psoriatic arthritis, are significant contributors to global disability, with increasing incidence in India, especially among young adults. This study investigates the potential of sesame (Sesamum indicum L.) lignans in functional food formulations aimed at preventive care of MSDs. Sesame seeds contain bioactive lignans—sesamin, sesamolin, and sesamol—with well-documented antioxidant, anti-inflammatory, and anti-arthritic properties. Despite extensive research on their pharmacological benefits, limited work exists on translating these compounds into functional food products. The present work involves systematic characterization of black and white sesame seeds, optimization of extraction techniques including Ultrasound-Assisted Extraction (UAE), Microwave-Assisted Extraction (MAE), and Supercritical Fluid Extraction (SCFE), and formulation of a ready-to-drink (RTD) functional beverage. Roasting enhanced phenolic content and bioactive accessibility, with SCFE yielding the highest concentration of lignans, confirmed via FTIR and HPLC analyses. Subsequent stages involve isolation, purification, and in vitro evaluation of anti-inflammatory and anti-rheumatic activity. The optimized RTD formulation incorporates natural stabilizers, emulsifiers, and antioxidants to ensure bioavailability and shelf stability. This research highlights the potential of Sesamum indicum as a sustainable, plant-based source for developing functional foods targeting musculoskeletal health, bridging traditional medicinal wisdom with modern nutraceutical innovations.

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Eco-Friendly Fishing: Integrating Fish Aggregating Devices and Sustainable Nets for Marine Conservation

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Abstract:

Traditional fishing gear, including Fish Aggregating Devices (FADs) and nets, has contributed to unsustainable practices and marine pollution. These non-biodegradable FADs contribute to marine litter, harming the marine ecosystem. To address this, eco-friendly FADs made from biodegradable materials such as polylactic acid (PLA) are being developed. These innovative devices help attract fish while minimizing environmental impact. The integration of sustainable nets with biodegradable FADs ensures reduced bycatch, enhanced selectivity, and minimized damage to marine habitats. By incorporating quick-release mechanisms and biodegradable materials, these designs promote sustainable fishing practices and marine conservation. This project aims to design and implement PLA-based FADs and sustainable fishing nets to create an eco-friendly approach to marine resource management, addressing the urgent need for sustainable and responsible fishing methods.

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Enhancing Data Protection through AI-Driven Cloud Security Frameworks

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Abstract:

The rapid adoption of cloud computing has transformed data storage and accessibility but has also increased vulnerability to sophisticated cyberattacks and unauthorized access. Traditional security mechanisms are no longer sufficient to manage the dynamic and large-scale nature of cloud environments. This project proposes an AI-driven cloud security framework that integrates machine learning algorithms and intelligent threat detection systems to enhance data protection. The framework employs predictive analytics to identify anomalies, detect intrusion patterns, and respond to threats in real time. Additionally, it incorporates automated encryption management, user behavior analysis, and adaptive authentication to strengthen data confidentiality, integrity, and availability. By leveraging artificial intelligence, this approach enables proactive security management, minimizes human error, and ensures compliance with global data protection regulations. The proposed system demonstrates the potential of AI-based cloud security frameworks to provide a robust, scalable, and self-learning defense mechanism for modern digital infrastructures.

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AI-Powered Human Digital Twin for Personalized Health Monitoring

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Abstract:

The AI-Powered Human Digital Twin for Personalized Health Monitoring is an intelligent platform that creates a virtual replica of an individual capable of learning from continuous health data. By integrating Artificial Intelligence (AI), Machine Learning (ML), and wearable sensor analytics, the system forms a comprehensive digital health ecosystem that supports preventive and personalized healthcare. It addresses key health challenges such as irregular sleep, poor lifestyle habits, stress, and dietary imbalance by processing real-time physiological and behavioral data, including heart rate, sleep patterns, and physical activity. The platform includes advanced modules for Health Data Monitoring, Predictive Analytics, Lifestyle Simulation, and Smart Recommendations. Using algorithms such as Long Short-Term Memory (LSTM), Random Forest, and Reinforcement Learning, it predicts future health outcomes and provides preventive lifestyle suggestions. A "what-if" simulation engine allows users to visualize the impact of specific lifestyle changes on long-term wellness. A user-friendly dashboard presents visual insights into health trends and recommendations, integrating data from wearable devices and mobile applications to promote early anomaly detection and proactive care. This approach enhances preventive medicine, empowers individuals with personalized insights, and contributes to improving overall quality of life.

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Autonomous 6WD Face-Recognizing Robot with Interactive TFT Touch Display

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Abstract:

The Autonomous 6WD Face-Recognizing Robot is an AI-powered robotic system that integrates artificial intelligence, computer vision, and embedded control for intelligent surveillance and automation. The robot combines ESP32-CAM, ESP32 Dev Module, and Arduino Uno to create a hybrid platform capable of both manual and autonomous operation. It addresses challenges in smart monitoring, including limited automation, manual supervision, and the need for real-time recognition and navigation. Key modules include AI-Based Face Recognition, Obstacle Detection, Dual-Mode Control (Manual & Autonomous), and a TFT Touch Display Interface. Using OpenCV and face recognition algorithms, the ESP32-CAM captures and analyzes live video to identify individuals from a trained dataset. The ESP32 Dev Module controls the six-wheel drive system and processes ultrasonic sensor data to detect and avoid obstacles in real time. The Arduino Uno manages the TFT touch display, allowing users to switch control modes and monitor robot status interactively. By leveraging AI, embedded systems, and MicroPython, the robot enhances automation, precision, and responsiveness. Its dual-mode system enables remote surveillance and self-driven operation, making it adaptable for diverse real-world environments. Applications include smart surveillance, attendance automation, and security monitoring. This project demonstrates how AI-driven robotics can improve decision-making, human–machine interaction, and autonomous system efficiency.

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SMART IoT-Enabled Milk Quality Monitoring System for Nutrient and Adulteration Detection

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Abstract:

Milk is an essential component of human nutrition, but its quality is frequently compromised due to adulteration and nutrient degradation, posing serious health risks. This study presents a **smart IoT-enabled system** for continuous monitoring of milk quality and real-time detection of adulterants. The system integrates a NodeMCU (Wi-Fi module) as the primary controller, coupled with TDS (Total Dissolved Solids) and VL53L0X sensors. The TDS sensor identifies dissolved impurities such as water or detergents, while the VL53L0X sensor provides precise distance and level measurements for accurate data acquisition. Key nutrient parameters—including fat, SNF (Solid-Not-Fat), and protein content—are displayed on a 16x2 LCD and transmitted to the Blynk IoT cloud platform for remote monitoring and analysis. This IoT-based solution offers a fast, automated, and non-destructive method for milk quality assessment, enhancing transparency, traceability, and reliability across the dairy supply chain. By combining sensor technologies with cloud connectivity, the system ensures accurate nutritional evaluation, strengthens consumer trust, and supports effective food safety management in the dairy sector.

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Smart Storage Unit to Preserve Horticulture Production

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Abstract:

Gas leak detection is a vital component of safety in industries such as oil and gas, chemical manufacturing, and waste management. Conventional inspection methods are often time-consuming, labor-intensive, and pose risks to personnel. To address these challenges, this study proposes a **drone-based gas detection system** integrated with MQ series gas sensors, offering an innovative and efficient solution. The MQ sensor family—including MQ-2, MQ-4, MQ-6, and MQ-7—can detect gases like methane, propane, carbon monoxide, and hydrogen with high sensitivity and rapid response. Mounted on drones, these sensors can monitor large or hard-to-reach areas by continuously sampling air quality during flight. Collected data is transmitted in real time to a control station for analysis, enabling identification of potential leaks and gas concentration levels. This approach provides a safe, cost-effective, and rapid method for gas leak detection and environmental monitoring, significantly reducing human exposure to hazardous environments. The system supports preventive maintenance and contributes to smart industrial safety and sustainable environmental protection.

References:

1. K. Gokulnath, M. Madhavan, N. Narendhiran, C. Vignesh, "Modelling and Fabrication of Aerial Surveillance and Multipurpose Gas Leakage Detection Drone," International Advanced Research Journal in Science, Engineering and Technology (IARJSET), (2021), India.
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Modeling and Optimization of Microwave Drying of Medicinal Myrobalans: Kinetic Evaluation and Phytochemical Retention

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Abstract:

Microwave drying is an energy-efficient technique that enables rapid volumetric heating and preservation of bioactive compounds in medicinal plants. This study investigates the effect of microwave drying on drying kinetics, energy efficiency, and phytochemical retention of **Emblica officinalis, Terminalia chebula, and Terminalia bellerica**. Experiments were conducted at 300, 450, and 600 W, and moisture ratio data were fitted to four thin-layer drying models—Lewis, Page, Henderson–Pabis, and Midilli–Kucuk. Model performance was evaluated using the coefficient of determination (R^2), root mean square error (RMSE), and chi-square (χ^2) values. Increasing microwave power reduced drying time and energy consumption, enhancing process efficiency. Phytochemical analysis revealed that total hydrolysable tannins (THT) peaked at 450 W, whereas total phenolic content (TPC) and DPPH radical scavenging activity decreased at higher powers, indicating degradation of thermolabile phenolics. Fourier-transform infrared (FTIR) spectra confirmed changes in hydroxyl and carbonyl functional groups of phenolics and tannins, suggesting molecular modifications due to microwave treatment. Overall, 450 W microwave power was identified as the optimal condition, balancing energy efficiency with maximum retention of bioactive tannins, offering a sustainable method for processing medicinal myrobalans for nutraceutical applications.

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Ballon d'Or Prediction System: An Interactive Web-Based Platform for Predictive Rankings in Football Analytics

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Abstract:

The Ballon d'Or Prediction System is an interactive web application developed to provide football enthusiasts with a platform to explore current year nominees, their profiles, and statistical performance. The system integrates **data-driven insights, predictive algorithms, and interactive UI/UX design** to present player rankings progressively while detailing goals, assists, minutes played, positions, leagues, and achievements. Key features include clickable player profiles with overlay displays for trophies and statistics, stepwise ranking reveal with animations, and a responsive layout implemented using React and Tailwind CSS. Users can explore historical Ballon d'Or data, including past winners, record holders, and most-awarded players, alongside predictions for the current year. By combining interactive visualization, structured datasets, and predictive logic, the platform demonstrates how web technologies can make sports analytics more accessible, engaging, and informative. The project emphasizes user interactivity, visual clarity, and educational value, offering applications in fan engagement, football analysis, and sports education.

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Avatar Companio

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Abstract:

Avatar Companio is an intelligent virtual assistant platform designed to provide users with personalized interaction, task automation, and contextual support across various applications. Leveraging **Artificial Intelligence (AI), Natural Language Processing (NLP), and voice recognition technologies**, the system enables real-time communication through text and voice interfaces. Key functionalities include task scheduling, reminders, real-time information retrieval, and interactive multimedia support, making it adaptable for personal, educational, and professional environments. The platform employs machine learning algorithms to analyze user behavior and preferences, allowing adaptive responses and proactive suggestions. A user-friendly interface with cross-platform accessibility ensures seamless integration with desktop and mobile devices. Experimental evaluation demonstrates improved user engagement, task completion efficiency, and overall satisfaction compared to conventional digital assistants. This research highlights the potential of AI-driven avatar systems in enhancing productivity, user experience, and intelligent human–machine interaction.

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CLOUD INTEGRATED IoT TRAFFIC DATA STREAMING SYSTEM

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Abstract:

Traffic congestion is one of the major challenges faced by smart cities today, leading to delays, fuel wastage, and environmental pollution. Traditional traffic monitoring systems rely on static sensors and offline data processing, resulting in delayed responses and inefficient management. This paper presents a Cloud Integrated IoT Traffic Data Streaming System that provides real-time traffic monitoring and visualization. The system employs Apache Kafka for high-throughput data streaming and Streamlit with Folium for interactive dashboard visualization. IoT sensors and edge devices simulate and transmit live traffic parameters such as vehicle count, speed, and GPS location to a cloud-based environment for processing. The prototype demonstrates real-time data ingestion, cloud integration, and visualization capabilities that enhance traffic management and decision-making. The system showcases the potential of combining IoT, big data, and cloud technologies for building efficient and scalable smart city infrastructure.

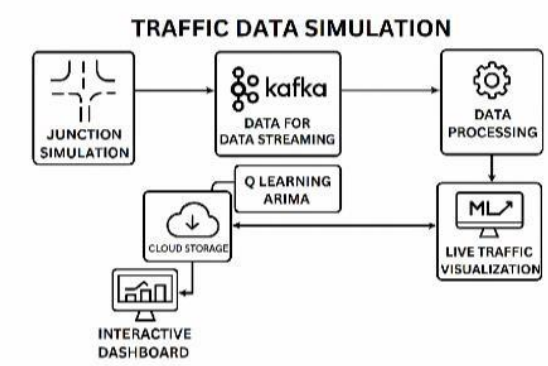

Fig: Data Simulation

References:

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A Multimodal Deep Learning Model For Predicting Chemotherapy-Induced Cardiotoxicity

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Abstract:

Chemotherapy has been a cornerstone of cancer treatment for decades, significantly improving patient survival rates. However, chemotherapy-induced cardiotoxicity has emerged as a critical side effect, leading to severe cardiac complications such as heart failure, arrhythmias, and myocardial infarction. Conventional diagnostic techniques, including echocardiography and biomarker monitoring, often detect cardiac damage only after substantial impairment, limiting timely medical intervention.

This study presents a **Multimodal Deep Learning Framework** integrated with **Explainable AI (XAI)** for early prediction of chemotherapy-induced cardiotoxicity. The system leverages clinical parameters and Tissue Doppler Imaging (TDI) data while employing **Conditional GAN (CGAN)** and **CTGAN** for data augmentation. Deep learning architectures such as **Inception**, **Inception with SVM**, and **EfficientNet** are utilized for feature extraction and classification. The use of **SHapley Additive Explanations (SHAP)** enhances model interpretability by identifying critical clinical predictors influencing cardiotoxicity risk.

The proposed model offers improved accuracy, transparency, and reliability in predicting adverse cardiac outcomes. This integration of AI with clinical diagnostics demonstrates the transformative potential of deep learning in advancing precision medicine and proactive cardiac care in oncology.

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MEDAI

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Abstract:

Diabetic retinopathy, hypertensive retinopathy, glaucoma, and contrast-related eye diseases are serious conditions arising from high blood pressure, elevated blood glucose, and increased intraocular pressure. Later-stage manifestations include cotton wool spots, restricted venous flow in the optic nerve, and retinal hemorrhages. If untreated, these conditions can lead to optic nerve damage, retinal artery obstruction, and potential blindness. Early detection is critical for preventing severe visual impairment.

This study introduces **CAD-EYE**, a novel methodology for classifying diabetic retinopathy, hypertensive retinopathy, glaucoma, and other contrast-related ocular conditions. The system employs **deep learning models MobileNet and EfficientNet**, integrating feature fusion to improve diagnostic accuracy. Fluorescence imaging is incorporated to enhance feature extraction, while explainable AI techniques are applied to increase interpretability and clinical transparency. The CAD-EYE system demonstrates potential for reliable, early-stage diagnosis, supporting timely medical interventions and improved patient outcomes.

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Automated Water Tank Cleaning System Using ESP32 Controller

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Abstract:

This study presents a novel **automated water tank cleaning system** utilizing the **ESP32 controller** to enhance the automation and efficiency of water storage maintenance. Traditional manual cleaning methods are time-consuming, labor-intensive, and often fail to maintain water quality standards. The proposed system integrates sensor networks, including **turbidity sensors** and cleaning brushes, to continuously monitor water quality in real time.

With **IoT integration**, the system enables remote monitoring and control through mobile applications or web platforms, allowing users to track system status, receive notifications, and schedule cleaning operations. Cloud-based analytics provide insights into water quality trends, system performance, and predictive maintenance. Performance evaluation demonstrates improved water purity, reduced manual intervention, and increased reliability.

The intelligent cleaning system offers scalable solutions for residential, commercial, and industrial water storage applications, promoting sustainable water management practices and safeguarding public health through automated quality assurance.

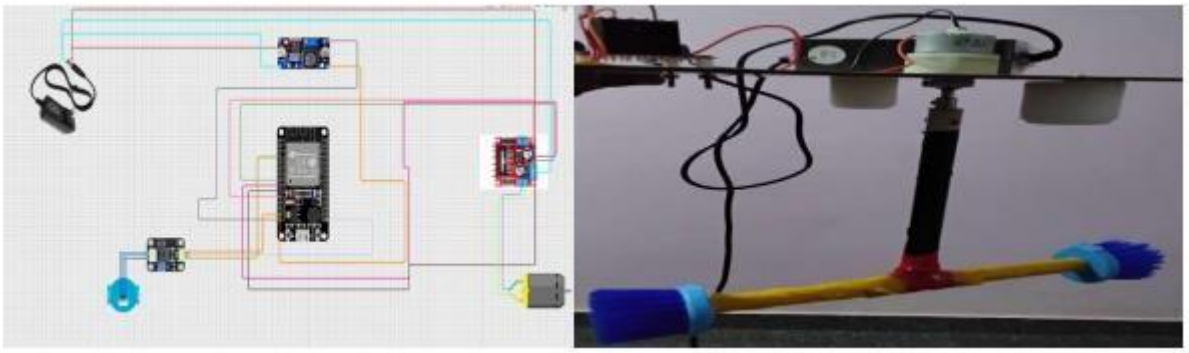

Fig. Circuit Diagram and Final Product of Automated Water Tank Cleaning System Using ESP32 Controller

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Development of Cellulose-Based Bio Nanocomposites from Sawdust for Sustainable Food Packaging

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Abstract:

This study focuses on the development of biodegradable nanocomposite food packaging films derived from cellulose extracted from mixed sawdust, an abundant lignocellulosic waste material. Sawdust, containing approximately 40–50% cellulose, was treated with Deep Eutectic Solvent (DES) to extract pure cellulose, followed by its conversion into nanocellulose. The synthesized nanocellulose was blended with biopolymers to fabricate eco-friendly, food-grade packaging films.

The films were characterized using SEM, FTIR, TGA, and XRD to evaluate their structural, thermal, and functional properties. The developed nanocomposite films offer a sustainable alternative to conventional petroleum-based plastics, significantly reducing environmental pollution and promoting a circular bioeconomy. This approach demonstrates the potential of converting industrial waste into high-value, environmentally friendly materials for food packaging applications.

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Digital Twin System for Real-Time Monitoring System

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Abstract:

This paper presents the development of a **Digital Twin System for Real-Time Monitoring** of a smart city using **Internet of Things (IoT)** and **Augmented Reality (AR)** technologies. A digital twin serves as a **virtual replica of the physical city**, continuously updated with live data from environmental and structural sensors. IoT sensors monitor key parameters such as air quality, temperature, humidity, and building integrity. Sensor data are processed using **Arduino IDE** and transmitted via **NodeMCU** to the **Blynk cloud platform** for real-time visualization and storage.

A 3D model of the city is designed in **Blender**, while an interactive mobile application is developed using **Android Studio** integrated with **AR Core**, allowing users to visualize the digital twin in real-world space. The system provides **analytics and dashboards** for monitoring environmental conditions, identifying pollution zones, and predicting trends. Additionally, it enhances public safety by providing **early warnings for hazardous conditions** such as gas leaks or extreme weather.

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Sensor-Based Robot for Plastics Debris Removal in Water Bodies

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Abstract:

Plastic pollution in marine environments has emerged as a critical global challenge, threatening aquatic ecosystems, biodiversity, and human livelihoods. This project proposes an innovative solution: a **smart, autonomous floating robot** designed to detect, collect, and store plastic waste from oceans, rivers, and lakes. The system integrates mechanical collection mechanisms with advanced **sensor technologies** to ensure efficient and eco-friendly operation.

The robot is engineered to float seamlessly on water surfaces, navigating through polluted zones using embedded sensors and detection frameworks. These sensors, potentially including **image recognition modules**, enable the robot to distinguish plastic waste from marine life and other natural elements, ensuring safe and targeted collection. Once identified, the waste is captured using **mechanical arms or suction systems** and stored in onboard containers for later disposal or recycling.

A key feature of the system is its **scalability and adaptability**. While initially designed for oceanic deployment, the robot can be customized for use in smaller water bodies such as rivers and lakes, making it a versatile tool in combating plastic pollution across diverse environments. The device is powered by **renewable energy sources**, such as solar panels, to maintain sustainability and reduce its carbon footprint.

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Smart Storage Unit to Preserve Horticulture Production

Kumaravel S[1], Kaviyarasan T[1], Harish S[1]

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Abstract:

Gas leak detection is a vital component of safety in industries such as oil and gas, chemical manufacturing, and waste management. Conventional inspection methods are often time-consuming, labor-intensive, and pose risks to personnel. To address these challenges, this study proposes a **drone-based gas detection system** integrated with MQ series gas sensors, offering an innovative and efficient solution. The MQ sensor family—including MQ-2, MQ-4, MQ-6, and MQ-7—can detect gases like methane, propane, carbon monoxide, and hydrogen with high sensitivity and rapid response. Mounted on drones, these sensors can monitor large or hard-to-reach areas by continuously sampling air quality during flight. Collected data is transmitted in real time to a control station for analysis, enabling identification of potential leaks and gas concentration levels. This approach provides a safe, cost-effective, and rapid method for gas leak detection and environmental monitoring, significantly reducing human exposure to hazardous environments. The system supports preventive maintenance and contributes to smart industrial safety and sustainable environmental protection.

References:

4. K. Gokulnath, M. Madhavan, N. Narendhiran, C. Vignesh, "Modelling and Fabrication of Aerial Surveillance and Multipurpose Gas Leakage Detection Drone," International Advanced Research Journal in Science, Engineering and Technology (IARJSET), (2021), India.
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Smart Telemedicine Kiosk for Health Monitoring and Product Dispensation

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Abstract:

The rapid advancement of healthcare technology has emphasized the need for accessible, contactless, and efficient health monitoring systems. This paper presents the design and development of a **Smart Telemedicine Kiosk** that integrates biometric authentication with automated health monitoring and controlled product dispensation.

The proposed system functions as a health-aware vending machine capable of measuring vital parameters such as **body temperature and blood pressure**, verifying user identity through **biometric methods**, and dispensing medical products including over-the-counter medicines, sanitary items, and glucose supplements. It is particularly suited for semi-closed environments such as college campuses, hostels, and corporate offices, where immediate medical assistance may not always be available.

The kiosk incorporates **encrypted data storage** and secure communication protocols to ensure user privacy and prevent misuse through access control and transaction auditing. Future enhancements include **AI-driven health predictions**, mobile app integration for remote monitoring, and multilingual user interfaces. This innovative approach demonstrates how telemedicine, automation, and biometric security can converge to provide **scalable, reliable, and user-friendly healthcare support** in everyday environments.

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A Solar-Powered System for Efficient Turmeric Harvesting

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Abstract:

The design and fabrication of a **solar-powered turmeric harvesting machine** aim to provide a sustainable and cost-effective solution for small and medium-scale farmers. Traditional turmeric harvesting is labor-intensive, time-consuming, and requires significant manpower.

This project utilizes **renewable solar energy** to power a DC motor, which drives the harvesting mechanism through a sheet metal frame, disc, and wheels. A solar panel charges the battery, ensuring continuous operation even under low sunlight conditions. The machine is designed to uproot turmeric plants efficiently by cutting through soil and lifting the rhizomes with minimal damage. Lightweight sheet metal construction ensures durability and ease of handling, while the disc and wheel arrangement provides smooth mobility on farmland.

This system reduces dependence on manual labor, lowers operating costs, and supports eco-friendly farming practices. The **solar-powered turmeric harvester** is a step toward modernizing agriculture with renewable energy for sustainable rural development.

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AI-Enabled App for Rural Artisans

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Abstract:

Rural artisans form the backbone of India's cultural heritage and handicraft industries, yet they remain disadvantaged due to limited digital literacy, lack of market access, and dependence on middlemen. This project proposes the development of an **AI-enabled mobile application** designed to empower artisans by providing a multilingual, voice-guided, and offline-first platform that is simple to use even for low-literacy users.

The app eliminates intermediaries by directly connecting artisans with buyers, ensuring fair pricing, transparency, and wider market reach. Key features include **AI-driven product categorization, pricing recommendations, secure digital transactions, logistics tracking**, and cultural storytelling, which differentiate the solution from existing e-commerce platforms. The system is lightweight and compatible with low-end Android devices, built using **Kotlin (Android Studio)** for frontend, **Firebase** for backend services, and **TensorFlow Lite** for on-device AI integration.

Beyond technical innovation, the project emphasizes **social empowerment and cultural preservation**, offering artisans independence and dignity in their profession. By aligning with initiatives such as Digital India and Atmanirbhar Bharat, the solution enhances economic opportunities and contributes to sustainable rural development.

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Smart Monitoring System for Hospital Operations

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Abstract:

The Smart Monitoring System for Hospital Operations is an integrated web-based platform designed to simplify and automate hospital management processes. The system provides real-time monitoring of patients, efficient management of appointments, lab tests, pharmacy data, and emergency contacts—all within a unified interface. Using a Flask backend with MongoDB for data storage, the system ensures that all medical records are stored permanently and securely.

Doctors and staff can view patient histories, manage prescriptions, schedule appointments, and track lab test results dynamically. An integrated AI chatbot assists medical staff and patients by answering health-related queries and providing guidance. This solution enhances operational efficiency, reduces manual errors, and improves communication between departments. By digitizing patient information and automating hospital workflows, the project contributes to a more organized, accurate, and accessible healthcare management system, with potential extensions for telemedicine, IoT-based patient monitoring, and advanced data analytics.

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Ultrasonic-Assisted Extraction and In-Silico Evaluation of Bacosides from Bacopa monnieri for Cognitive Enhancement

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Abstract:

Bacopa monnieri, a traditional Ayurvedic plant, has neuroprotective effects and cognitive enhancement potential due to its saponins, bacosides. This study explores ultrasonic-assisted extraction (UAE) as a green, sustainable method to maximize bacoside yield. Acoustic cavitation enhances solvent penetration, disrupts plant cell walls, and facilitates the release of bioactives with minimal thermal degradation. Extraction parameters such as time, amplitude, and solid-to-solvent ratio were optimized.

Extracted compounds were characterized using chromatographic studies. Additionally, in-silico molecular docking analyzed the binding affinities of bacosides to key proteins associated with cognitive decline, Beta-secretase 1 (BACE1). The study demonstrates that UAE enhances yield while computational analysis supports functional efficacy, providing a framework for standardized nutraceutical development.

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Optimization of Pretreatment Conditions for Iron Enhancement and Anti-nutrient Reduction in Alternanthera sessilis via Response Surface Methodology

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Abstract:

Micronutrient deficiencies, particularly iron deficiency, affect global public health and socioeconomic status. Alternanthera sessilis, a rich source of iron, is limited by anti-nutrients such as phytates and oxalates that reduce iron absorption. This study develops a microwave blanching model using response surface methodology (RSM) to enhance iron bioavailability while minimizing anti-nutrients.

A Box-Behnken design evaluated the effects of blanching time, microwave power, and pH on iron, phytate, and oxalate content. Optimized conditions—300 W, 4 min, and pH 6.6—yielded maximum iron content (38.32 mg/100g) with reduced phytate (1.04 mg/100g) and oxalate (88.22 mg/100g). Microwave blanching preserved nutrition, chlorophyll, and antioxidant activity better than unprocessed or thermally blanched leaves. This approach demonstrates efficient enhancement of iron bioavailability in Alternanthera sessilis.

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Intelligent Accident Detection and Response System Using Deep Learning on Vehicular Edge Nodes

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Abstract:

Road accidents are a major global concern, causing significant fatalities and economic losses. Rapid detection and response are critical for minimizing injuries and ensuring timely emergency assistance. This study proposes an Intelligent Accident Detection and Response System using Deep Learning deployed on Vehicular Edge Nodes. The system leverages onboard vehicle sensors, cameras, and edge computing nodes to process real-time data, including vehicle speed, orientation, and collision parameters. A Convolutional Neural Network (CNN) is employed to detect accident scenarios from sensor data and video streams. Upon detection, the system automatically alerts nearby emergency services and sends location details to relevant authorities, enabling faster response times. Edge deployment ensures low latency and high reliability, reducing dependence on centralized cloud processing. Experimental evaluation demonstrates high accuracy in accident detection, rapid alert generation, and improved overall road safety. This approach highlights the potential of combining edge computing with deep learning for proactive traffic safety solutions.

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Phytochemical Profiling and Bioactive Potential of Cyperus rotundus L.: A Natural Source of Phenolic Antioxidants and Anti-Inflammatory Agents

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Abstract:

Cyperus rotundus L., a perennial sedge of the Cyperaceae family, is increasingly recognized for its rich composition of phenolic and flavonoid compounds, contributing to strong antioxidant and anti-inflammatory potential. This study investigates the phytochemical characterization, antioxidant activity, and anti-inflammatory mechanisms of C. rotundus extract, focusing on its phenolic composition and reactive oxygen species (ROS) scavenging capacity. FTIR and UHPLC-MS analyses confirmed major bioactive flavonoids, including myricetin, quercetin, and kaempferol, showing distinct absorption peaks corresponding to hydroxyl and aromatic ring structures responsible for biological efficacy. The extract exhibited high total phenolic content (~220 mg GAE/100 g) and strong DPPH radical inhibition exceeding 90%, indicating substantial free radical quenching activity. These phenolic constituents modulate pro-inflammatory mediators, inhibit cyclooxygenase and nitric oxide synthase pathways, and attenuate oxidative damage at the cellular level. Beyond antioxidant and anti-inflammatory effects, C. rotundus also exhibits anti-diarrheal, hepatoprotective, and antimicrobial activities, suggesting broader therapeutic potential. This research underscores C. rotundus as a promising natural source of phenolic antioxidants with multi-dimensional health benefits, supporting applications in functional foods and nutraceuticals.

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AI-Powered Sentiment Analysis Web Application

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Abstract:

The AI-Powered Sentiment Analysis Web Application is designed to interpret human emotions expressed through text using Artificial Intelligence (AI) and Natural Language Processing (NLP). The system, developed using the Flask framework in Python, integrates the VADER (Valence Aware Dictionary and sEntiment Reasoner) model to classify user input as positive, negative, or neutral. A user-friendly web interface built with HTML, CSS, and JavaScript enables real-time sentiment prediction with seamless interaction. This application demonstrates how AI can bridge human communication and technology by extracting opinions from textual data efficiently. It is suitable for customer feedback monitoring, social media analysis, and emotion-aware IoT systems. Future enhancements include the integration of deep learning-based models such as BERT for improved accuracy and multilingual analysis. The proposed system provides a cost-effective, scalable, and intelligent solution for understanding sentiment in modern digital communication.

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IoT-Enabled Temperature and Humidity Tracking System for Food Processing Industry

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Abstract:

In the food processing industry, maintaining optimal temperature and humidity levels is crucial to ensure product quality, safety, and shelf life. This project presents an IoT-enabled Temperature and Humidity Tracking System designed to provide real-time monitoring, data logging, and intelligent control of environmental conditions throughout the food processing and storage stages. The system integrates IoT sensors (such as DHT11/DHT22 or SHT31) with a microcontroller platform (like Arduino or ESP32) to continuously sense ambient temperature and humidity levels. The collected data is transmitted wirelessly via Wi-Fi or MQTT protocols to a cloud-based IoT platform such as ThingSpeak, Blynk, or Firebase, enabling remote monitoring and data visualization through dashboards or mobile applications. By integrating IoT technology into food industry operations, this project enhances process transparency, efficiency, and quality assurance. The system ensures regulatory compliance with food safety standards by maintaining optimal environmental conditions. Furthermore, its low-cost, scalable, and energy-efficient design makes it suitable for both small-scale and industrial food processing units. In conclusion, the IoT-enabled Temperature and Humidity Tracking System provides a smart, automated, and reliable solution for continuous environmental monitoring in the food processing industry, significantly reducing waste, improving product consistency, and supporting data-driven decision-making for sustainable production management.

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Development of Accelerated Test Method for Bioplastic Composting

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Abstract:

In the food processing industry, maintaining optimal temperature and humidity levels is crucial The biodegradability of bioplastics under controlled composting settings is frequently evaluated using standardized compostability testing techniques including ASTM D6400, ASTM D5338, and ISO 14855. These procedures, however, usually demand lengthy incubation times of 100 days or longer, delaying the screening of emerging sustainable polymers and slowing research advancement. The current study develops an accelerated composting test technique for efficient and precise biodegradability determination to overcome this limitation. The technique measures the evolution of carbon dioxide (CO2) as a direct indicator of biodegradation and uses regulated settings to enhance degradability activity. Initially, the procedure was standardized using natural substrates like cellulose and complex organic matter like potatoes to optimize crucial elements such as incubation time, aeration, and moisture content. The optimized procedure will be used to assess the degradation kinetics and CO2 evolution profiles of bioplastic materials, including polyhydroxyalkanoates (PHA) and polylactic acid (PLA), after successful validation. Preliminary findings indicate that the proposed accelerated approach significantly reduces composting time while remaining consistent with standard biodegradation procedures. This technique provides an economical, time-efficient, and environmentally relevant framework for early-stage bioplastic screening and supports the advancement of sustainable materials and the wider use of biodegradable substitutes in waste management and sustainable economy practices.

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Evaluation of Biofilm Inhibiting Property of Melanoidin

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Abstract:

The Maillard reaction produces high-molecular-weight, brown nitrogenous polymers called melanoidins, which are known for their antibacterial, antioxidant, and metal-chelating properties. This study investigates the anti-biofilm properties of crude melanoidin, a sustainable agro-industrial byproduct isolated from roasted coffee grounds. Purified low-molecular-weight fractions were obtained through hot-water extraction, centrifugation, and graded ethanol fractionation. Fourier Transform Infrared (FTIR) and UV-visible spectroscopy characterized the physicochemical properties of the extracted melanoidin, revealing absorption peaks corresponding to amide, hydroxyl, and carbonyl groups indicative of bioactive compounds. Microtiter plate biofilm assays and zone of inhibition tests evaluated antibacterial and anti-biofilm activity against *Pseudomonas aeruginosa* and *Staphylococcus aureus*. The minimum inhibitory concentration (MIC) demonstrated concentration-dependent inhibition. Results showed that coffee-derived melanoidin significantly reduced bacterial adherence and disrupted mature biofilms, likely by interfering with quorum sensing and extracellular polymeric substance (EPS) synthesis. The study highlights melanoidins as natural, food-grade, environmentally friendly bio-products for biofilm control, with applications in food preservation and medical industries.

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Screening of Probiotic Bacterial Species from Fermented Foods Targeting Histamine Intolerance

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Abstract:

Histamine intolerance is an underdiagnosed condition caused by an imbalance between dietary histamine and its degradation in the gastrointestinal system, leading to symptoms such as headaches, digestive disturbances, and allergic reactions. Microbial interventions can help manage histamine levels, but limited research exists on isolating native bacteria from traditional fermented foods capable of degrading histamine. This study isolates bacterial strains from South Indian fermented foods, including idli and dosa batter, using serial dilution and selective culturing. Strains were screened for histamine metabolism using enzymatic assays, spectrophotometry, and molecular characterization, focusing on diamine oxidase (DAO) activity. The methodology included sample collection, microbial isolation, and qualitative and quantitative analysis of histamine degradation. The research aims to identify strains with high histamine-degrading potential, supporting the development of functional starter cultures for fermented foods to mitigate histamine accumulation. The outcomes contribute to understanding microbial ecology in fermented foods and offer practical solutions for reducing histamine-related health risks.

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AI-Driven Community Language Preserver & Storyteller for Tamil Dialects

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Abstract:

The rapid decline of Tamil dialects and folk storytelling poses a significant threat to linguistic diversity and cultural heritage in South India. This project introduces an AI-driven platform designed to preserve and promote endangered Tamil dialects. Community elders record folk stories, proverbs, and idioms in their dialect. Audio inputs are processed using Automatic Speech Recognition (ASR) and Natural Language Processing (NLP) modules tailored for Tamil dialectal data. The system performs speech-to-text transcription, dialect-to-standard Tamil and English translation, and semantic annotation, elucidating unique phonological, morphological, and idiomatic features. Transformer-based models (LLaMA, MarianMT) trained via Low-Rank Adaptation (LoRA) identify metaphors and cultural nuances. An AI-powered recommendation engine curates stories based on region and personal interests. The platform employs a scalable, cloud-compatible backend, providing an accessible dashboard for archiving, analysis, and personalized storytelling, safeguarding linguistic diversity and encouraging intergenerational knowledge transfer.

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Autonomous Cyber Defense Using AI-driven Intrusion Detection System

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Abstract:

The growing sophistication of cyberattacks, including SQL injection, cross-site scripting (XSS), and buffer overflow, poses major challenges to secure digital systems. Traditional intrusion detection systems (IDS) rely on static signatures and manual rule updates, making them inefficient for evolving threats. This project proposes an AI-driven IDS combining Deep Neural Networks (DNNs) and Reinforcement Learning (RL) to detect, analyze, and mitigate cyber intrusions autonomously. The DNN component, implemented in TensorFlow with convolutional and recurrent architectures, analyzes behavior patterns and classifies vulnerabilities, achieving up to 95% accuracy on the Juliet Test Suite. The RL agent, modeled as a Markov Decision Process (MDP) in a sandboxed Docker environment, learns optimal response strategies through reward feedback. A Flask-based web interface allows real-time detection, code uploads, automated mitigation reports, and interactive threat visualization dashboards. Evaluated with precision, recall, and reward convergence metrics, the system demonstrates scalability, adaptability, and autonomous defense against zero-day threats.

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Phishing and Language Detection

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Abstract:

Phishing attacks exploit linguistic and contextual cues across multiple languages to deceive users. This project, Phish-Lens, presents a framework for automatic phishing detection by combining language identification and supervised machine learning on text and URL features. Incoming messages and URLs are processed with a lightweight language-detection module for language-specific preprocessing. Feature extraction combines lexical, syntactic, URL-based, and semantic embeddings produced by multilingual transformer encoders. Features feed into an ensemble classifier (gradient boosted trees with neural embeddings) optimized using stratified sampling and cost-sensitive training. Phish-Lens is evaluated on a curated multilingual dataset (English, Hindi, Tamil) and public phishing corpora, reporting accuracy, precision, recall, F1-score, and ROC-AUC. Results demonstrate that language-aware preprocessing and multilingual embeddings improve detection across low-resource languages while reducing false positives. The system is lightweight for integration into messaging clients or email gateways and includes an explainability module highlighting influential features for flagged messages.

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Planning and Design of Multistorey Restaurant Building Using STAAD.Pro Analysis

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Abstract:

The rapid growth of urban infrastructure has increased the demand for efficient structural planning and analysis of multistorey commercial buildings. This study focuses on the planning and structural design of a multistorey restaurant building using STAAD.Pro, a widely used structural analysis and design software. The project encompasses architectural planning, load calculations, and structural modeling, including the application of dead, live, and seismic loads as per Indian Standard codes. The analysis evaluates the internal forces, bending moments, shear forces, and deflections to ensure structural safety and serviceability. Design optimization is carried out for reinforced concrete beams, columns, and slabs to achieve an economical and safe structure. The study demonstrates that STAAD.Pro provides accurate results for complex multistorey structures and assists engineers in achieving optimal structural performance while adhering to regulatory guidelines.

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Design Analysis and Planning of Residential Building for DGP House

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Abstract:

The project focuses on the planning, analysis, and design of a G+2 residential building using both manual calculations and STAAD.Pro software. The structural members including beams, columns, slabs, and footings were designed using the Limit State Method as per IS:456-2000. Load calculations were performed according to IS:875 (Parts 1, 2, 3) for dead, live, wind, and seismic loads. The building layout was designed following the National Building Code of India (NBC). AutoCAD was used for drafting the floor plans, and STAAD.Pro was used for structural verification. The study aims to develop an economical, energy-efficient design while ensuring structural safety, serviceability, and compliance with relevant standards.

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Design and Analysis of Residential Apartment Building Using STAAD.Pro

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Abstract:

This study involves the structural design and analysis of a residential apartment building using STAAD.Pro software. The primary objective was to ensure structural stability, safety, and serviceability under dead, live, wind, and seismic loads. The software was used to determine bending moments, shear forces, deflections, and axial forces in various structural members. The building design follows IS 456:2000 and other relevant Indian Standards. Detailed structural drawings were prepared for practical implementation. The project demonstrates the application of structural analysis and design principles for high-rise residential buildings, achieving both economic efficiency and structural integrity.

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Fauth AI – A Multimodal Deepfake Detection using Deep Learning

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Abstract:

FauthAI is an end-to-end framework for deepfake detection integrating CNNs for local artifact detection, RNNs/LSTMs for temporal inconsistency analysis, and Vision Transformers for global feature extraction. The system also employs frequency domain and audio-based analysis for spectral anomalies and voice signature evaluation. Multimodal fusion of audio-visual data and ensemble learning enhances detection accuracy across datasets such as DFDC, Face Forensics++, Celeb-DF v2, and ASVspoof. The framework offers a scalable and robust solution for digital content authentication, media forensics, and misinformation management.

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Cart Sense – RFID-based Smart Trolley with Automated Billing

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Abstract:

Cart Sense is a smart trolley system that automates the shopping experience by integrating RFID technology, IoT, and embedded systems. Each product is tagged with RFID, and the trolley automatically detects items, updates billing in real-time, and synchronizes with a cloud-based database. Customers can make cashless payments via UPI or digital wallets. The system enhances shopping efficiency, accuracy, and inventory management, representing an advancement in modern retail automation.

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