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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

DIGITIMES

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ABOUT DIGITIMES

DigiFlash

DigiFlash is the student association of Computer Science and Engineering Department, MCET, Pollachi. The objective of our association is to innovate,create and sharpen the minds of the students to compete globally. It is a platform to improve the student's knowledge and also create opportunities to interact with leading industry persons. Digiflash is organizing number of Co-Curricular activities including special lectures by Experts, Workshops, Technical Seminars, Coding Events, Paper & Poster Presentations and Webinars. Digitimes is a part of Digiflash. A magazine that features the latest Technological advancements in the field of Computing.

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COMPUTER SCIENCE AND ENGINEERING

VISION OF THE DEPARTMENT

To develop engineers with global employability, capability, research focus and social responsibility

MISSION OF THE DEPARTMENT

- To develop internationally competent engineers in dynamic IT field by providing state-of-art academic environment and industry driven curriculum.
- To motivate and guide students to take up higher studies and establish entrepreneurial ventures.
- To enrich the department through committed and technically sound faculty team with research focus in thrust areas.
- To undertake societal problems and provide solutions through technical innovations and projects in association with the industry, society and professional bodies.

Programme Educational Objectives (PEOs)

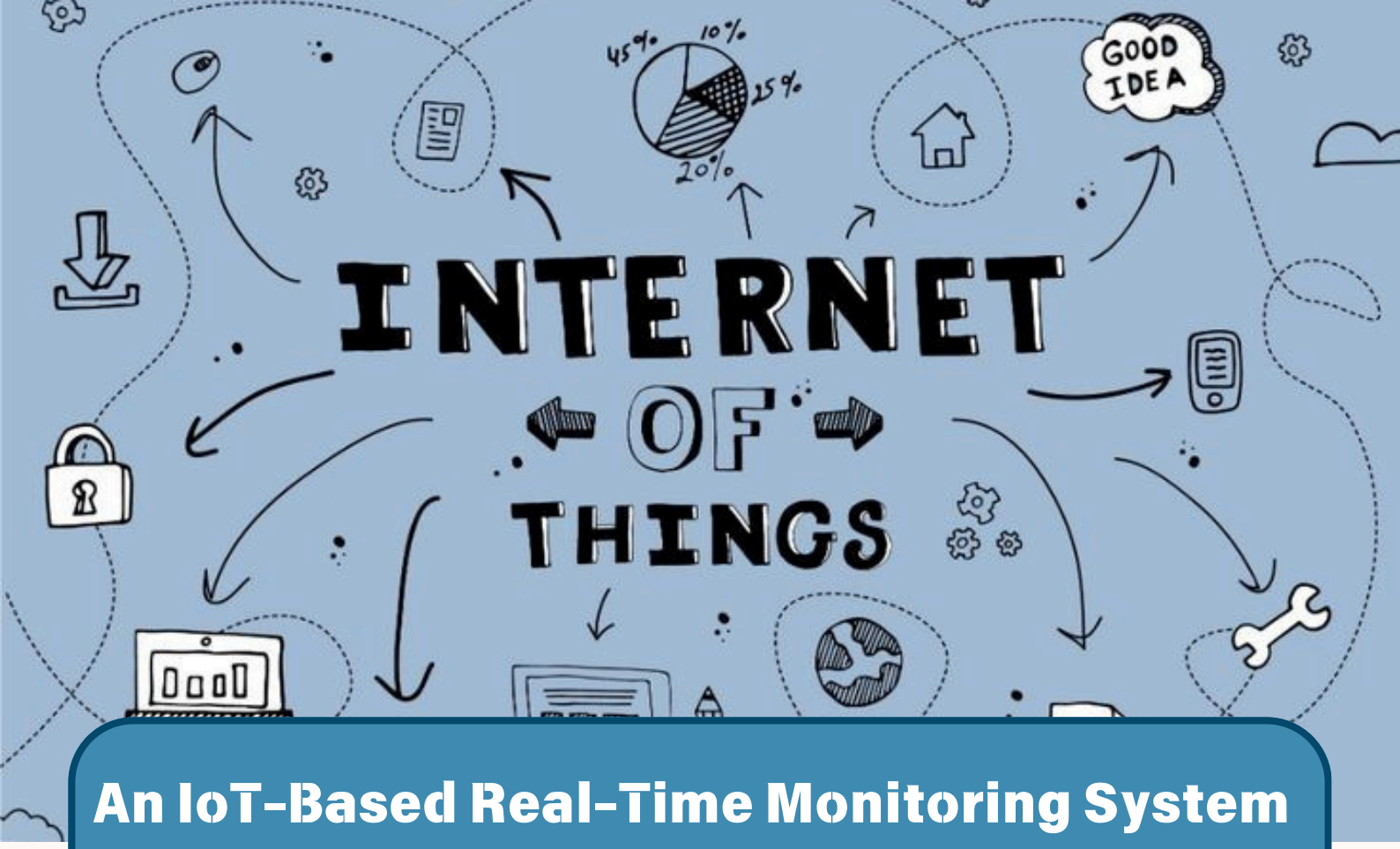
PEO 1: Domain Expertise - Possess expertise and emerge as key players in IT integrated domains.
PEO 2: Computing Skills and Ethics - Employ computing skills to solve societal and environmental issues in an ethical manner.
PEO 3: Lifelong Learning and Research - Involve in lifelong learning and research to meet the demands of global technology.

Programme Outcomes (POs)

PO1.Engineering Knowledge : Apply the knowledge of mathematics, science, engineering fundamentals and concepts of Computer Science to solve complex engineering problems.
PO2.Problem Analysis : Identify, review literature, formulate and analyse complex engineering problems using first principles of mathematics and engineering sciences.
PO3.Design and Development of Solutions : Design and develop computing solutions for complex engineering problems with societal and environmental awareness.
PO4.Complex problem Investigation : Investigate complex problems by employing research methods to arrive at valid conclusions.
PO5.**Modern Tool Usage :** Evaluate and use appropriate tools and techniques in engineering activities .
PO6.**Societal contribution :** Follow professional engineering practice by applying contextual knowledge to assess societal and legal issues.
PO7.Environment and Sustainability : Understand and provide professional engineering solutions taking into consideration environmental and economic sustainability.
PO8.Ethics : Follow ethical principles and norms in engineering practice.
PO9.Individual and Team work : Function effectively as an individual, team member or leader in diversified environments.
PO10.Communication : Communicate effectively through various modes for all engineering activities.
PO11.Project Management and Finance : Apply Engineering knowledge and management principles for effective project management in multi-disciplinary environments.
PO12.**Life-long Learning :** Engage in independent life-long learning and skill development for professional and social well being.

Programme Specific Outcomes (PSOs)

PSO1. **Systems Engineering:** Employ software engineering principles in the design and development of efficient systems.
PSO2. Knowledge Engineering: Apply data analytics techniques for solving real world problems.



An IoT-Based Real-Time Monitoring System for Temperature, Humidity, and Ammonia Detection in Perishable Food Storage

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Yogeshwaran C - 727622BCS117

ABSTRACT

The growing need for preserving perishable goods during transportation and storage has accelerated the development of intelligent environmental monitoring systems. Leveraging the Internet of Things (IoT), this project presents a smart solution integrating sensors, automated cooling, and alert mechanisms to ensure optimal food safety. Central to the system are the DHT22 and MQ135 sensors, which provide real-time monitoring of temperature, humidity, and ammonia level, critical indicators of spoilage. A TEC1-12706 Peltier module, controlled by a PID-based logic, dynamically maintains the desired temperature, while a GSM module and buzzer offer proactive alerts in abnormal conditions. Unlike conventional systems, this setup not only reacts to threshold breaches but also enables predictive spoilage detection through sensor trends.

Designed with cost effectiveness and scalability in mind, the system offers a reliable solution for maintaining cold chain integrity in food logistics and storage environments.

INTRODUCTION

In today's food supply chain, ensuring the integrity of perishable items during storage and transportation remains a major concern. Variations in temperature, high humidity levels, and the buildup of gases such as ammonia, often associated with spoilage, can significantly accelerate the degradation of food. These issues not only cause financial losses but also contribute to increased food waste and pose health risks. Traditional cold storage systems generally lack the adaptability and intelligence required to react promptly and effectively to such environmental changes.

This project proposes an IoT based environmental monitoring and control system designed to maintain optimal storage conditions for perishable goods. The system integrates multiple sensors, including the DHT22 for temperature and humidity sensing, and the MQ135 for detecting ammonia, a key indicator of food spoilage. Real-time data from these sensors is processed by an Arduino UNO microcontroller, which drives a Peltier-based cooling module regulated by a PID controller to maintain a stable internal environment. What sets this system apart is its automation and adaptability. Unlike static cooling systems, the PID controlled mechanism dynamically adjusts the cooling intensity based on sensor feedback. Additionally, a buzzer and GSM module provide immediate alerts to stakeholders when critical thresholds are breached, enabling timely intervention. All environmental parameters are displayed on an LCD, ensuring transparency and ease of local monitoring. Designed with scalability and cost-effectiveness in mind, this system is suitable for deployment in various applications, including refrigerated transport, food warehouses, supermarkets, and local vendors. It also lays the groundwork for future enhancements, such as cloud-based analytics, mobile notifications, and AI based spoilage prediction models, making it a robust solution for modern cold chain logistics.

EXISTING SYSTEM

The Current systems used for monitoring perishable goods are largely dependent on basic technologies such as analog or digital temperature sensors and simple humidity monitors. These systems often lack the ability to process data in real time and provide limited or no automation. Most rely on manual checks or fixed threshold-based thermostats, which may record environmental conditions but cannot dynamically respond to changes or initiate corrective actions like cooling. Additionally, they lack intelligent control mechanisms and are not capable of detecting early signs of food spoilage, such as the presence of ammonia gas—an indicator often emitted during decomposition of meat and dairy products.

Furthermore, these conventional systems generally do not feature alert mechanisms such as buzzers or remote notification tools like GSM modules, which are critical in providing timely warnings to users. This makes them inefficient in time-sensitive environments, especially during transit or in mobile storage units. Another major limitation is the absence of scalability and integration with IoT-based platforms, which restricts their use in modern, data-driven logistics operations. Without feedback loops, real-time monitoring, or predictive analytics, these systems are not suitable for today's dynamic and distributed cold chain environments.

Therefore, there is a strong need for an intelligent, automated, and responsive system to ensure optimal food preservation and minimize spoilage.

PROPOSED SYSTEM

The proposed system is designed to monitor and maintain optimal environmental conditions for perishable goods using an intelligent IoT based architecture. The system integrates multiple hardware components, including the DHT22 sensor for measuring temperature and humidity, and the MQ135 gas sensor for detecting ammonia a key indicator of food spoilage. These sensors provide real-time environmental data, which is processed using an Arduino Uno microcontroller.

The process begins with continuous data collection from the sensors. Temperature and humidity readings from the DHT22 and gas concentration values from the MQ135 are captured and interpreted to evaluate the freshness of stored items. If the temperature exceeds a predefined threshold, a PID-controlled Peltier module is activated to initiate cooling. This dynamic control mechanism ensures efficient energy usage and maintains a stable environment. Ammonia levels are also analyzed to detect early signs of spoilage.

The system includes an alert mechanism where a buzzer is triggered, and an SMS is sent via the GSM module if critical temperature or ammonia thresholds are breached. Additionally, a 16x2 LCD is used to display real-time readings, ensuring easy local monitoring. The entire system operates autonomously, allowing it to function in transportation vehicles or storage units without constant human supervision.

The future enhancements can include integrating machine learning models trained on sensor data to predict spoilage more accurately, as well as cloud-based logging and remote dashboard access. Overall, the proposed system provides a smart, responsive, and cost effective solution for cold chain management, ensuring the safety and quality of perishable products throughout their lifecycle.

LITERATURE SURVEY

The literature survey challenge of analyzing recent advancements in Internet of Things (IoT) technology have significantly enhanced environmental monitoring systems, particularly in the field of cold chain management and perishable goods preservation. Existing research has explored various sensor-based solutions for real-time temperature and humidity tracking, aiming to reduce spoilage during storage and transportation.

In one study, wireless sensor networks (WSNs) were deployed in cold storage facilities to monitor ambient temperature using low-power microcontrollers and basic temperature sensors. While this approach provided continuous data logging, it lacked dynamic control features and alert systems, limiting its real-time responsiveness. Another work by Singh et al. (2021) proposed a GSM based cold storage monitoring system that used a DHT11 sensor to collect environmental data and sent SMS alerts when temperature thresholds were breached. However, it lacked ammonia detection, predictive intelligence, and cooling system integration.

A system proposed by Zhang et al. (2020) incorporated a basic feedback mechanism using thermistors and actuated fans based on temperature variations. While effective in regulating heat, the system did not provide humidity control or spoilage gas detection, which are critical for certain food products. Research has also focused on the integration of cloud platforms such as Firebase and Thing Speak to visualize sensor data remotely. These systems are generally limited to monitoring and do not include active environmental regulation or on-device alert capabilities.

Gas sensors like MQ135 have been widely used in air quality monitoring systems but are underutilized in food spoilage detection. When applied, these sensors can detect increasing ammonia levels, a key indicator of bacterial decomposition in meats and dairy products. However, systems incorporating gas detection for spoilage prediction are still limited in number and usually lack integration with cooling or alert functionalities.

To address these gaps, recent works have begun exploring multi-sensor fusion combined with machine learning algorithms for spoilage prediction. However, many of these models remain computationally intensive and are not suitable for deployment on microcontroller based platforms like Arduino Uno. Therefore, most small-scale IoT systems still rely on threshold-based decision making.

In summary, while prior research provides foundational knowledge in temperature and humidity monitoring, there remains a significant gap in unified systems that combine realtime sensing, ammonia based spoilage detection, automated cooling control via PID, and remote alerting through GSM or IoT platforms. The proposed system aims to bridge this gap by integrating all of these components into a compact, affordable, and scalable solution for cold chain environments.

METHODS

System Architecture Overview: The system architecture of the proposed IoT-based environmental monitoring solution is designed to ensure seamless integration of sensing, processing, control, and alert functionalities for the preservation of perishable goods. At the heart of the system is the Arduino Uno microcontroller, which serves as the central unit for data acquisition and control operations. Simultaneously, the system uses a 16x2 LCD to display real-time sensor values and provides alerts via a buzzer and GSM module to inform users of potential risks. This robust architecture ensures real-time monitoring, automatic response, and remote notification, making it highly suitable for cold chain logistics and food storage applications.

Sensor Data Acquisition: The sensor data acquisition process is a fundamental component of the proposed system, enabling real-time monitoring of environmental parameters critical to the preservation of perishable goods. The system utilizes two key sensors: the DHT22 and the MQ135.

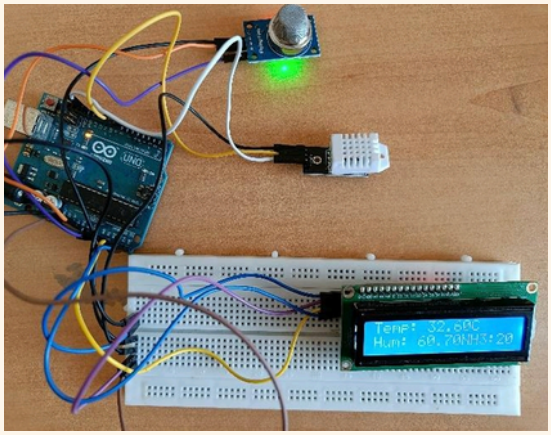

Figure: Sensor Readings on LCD

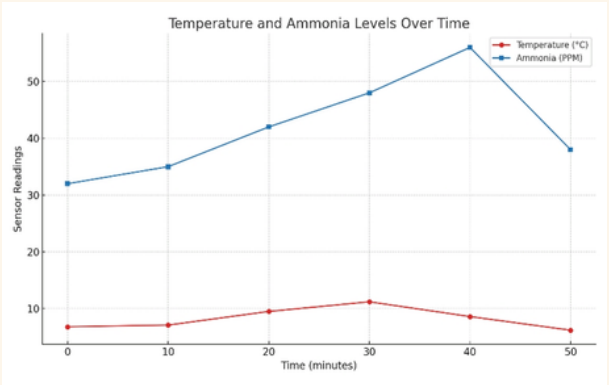

Figure: Temperature and NH_3 Levels vs. Time

The DHT22 sensor is responsible for measuring ambient temperature and relative humidity with high accuracy and stability, making it suitable for cold storage environments. Simultaneously, the MQ135 gas sensor is employed to detect the concentration of ammonia (NH_3), a common byproduct of food spoilage. This sensor data forms the basis for environmental analysis, alert generation, and automatic activation of the cooling system, ensuring timely and efficient preservation of stored items.

Data Preprocessing and Filtering: Data preprocessing and filtering play a crucial role in ensuring the reliability and accuracy of sensor readings within the proposed IoT based monitoring system.

Cooling Control Mechanism: The cooling control mechanism is a vital component of the proposed system, designed to regulate temperature in real time and prevent spoilage of perishable goods.

Alert Generation and Notification System: The alert generation and notification system is designed to promptly inform users of critical environmental conditions that could compromise the safety of perishable goods. The system uses a two level alert mechanism. The combination of audible and remote alerts enhances reliability and responsiveness, enabling quick action to prevent spoilage and minimize losses.

Real-Time Monitoring Interface: To facilitate immediate visibility into environmental conditions, the system includes a real-time monitoring interface using a 16x2 I2C LCD display. This display is connected to the Arduino Uno and is updated continuously with the latest readings from the DHT22 and MQ135 sensors.

Performance Evaluation: To assess the effectiveness of the proposed system, performance evaluation was conducted under simulated storage conditions. The evaluation focused on key parameters such as system responsiveness, sensor accuracy, cooling efficiency, and alert reliability. Multiple test scenarios were created, including gradual temperature rise, sudden ammonia spike, and simultaneous changes in environmental conditions.

Power Supply and Component Integration: This section describes the power requirements and wiring configuration of the system components. The Arduino Uno is powered through a 5V USB or adapter input, while the high-current devices like the Peltier module and cooling fan require a separate 12V DC power supply.

MODULE DESCRIPTION

A. Sensor Module Description: The sensor module is responsible for collecting real-time environmental data. It consists of the DHT22 sensor, which measures temperature and humidity, and the MQ135 gas sensor, which detects ammonia (NH_3) levels.

B. Processing Module Description: The processing module is the brain of the system, built around the Arduino Uno microcontroller. It continuously reads input from the sensors, processes the data, and executes logic based on predefined safety thresholds.

C. Cooling Module Description: This module maintains optimal temperature conditions for perishable goods. It includes a TEC1-12706 Peltier cooler, a cooling fan with a heatsink, and a relay for power control.

D. Alert Module Description: The alert module provides both local and remote notifications in case of critical conditions. It includes a buzzer, which activates when temperature or ammonia levels exceed safety limits, and a SIM800L GSM module, which sends SMS alerts to a predefined phone number.

E. Display Module Description: The display module features a 16x2 LCD with I2C interface, which presents real-time sensor data to the user. It shows temperature (°C), humidity (%), and ammonia levels (PPM), providing an at-a-glance view of storage conditions.

CONCLUSION

In this project, an IoT-based environmental monitoring system was successfully developed to maintain and safeguard the quality of perishable goods during storage and transportation. The system effectively monitors real-time temperature, humidity, and ammonia levels using DHT22 and MQ135 sensors, and responds dynamically through a Peltier-based cooling module regulated by a PID controller. Additionally, the integration of a buzzer and GSM module ensures that critical alerts are delivered both locally and remotely. The implementation of a 16x2 LCD provides continuous on-site visibility of environmental conditions. Performance evaluation demonstrated high reliability, fast response times, and accurate detection of abnormal conditions, making the system suitable for cold chain logistics and small scale storage units.

INVENTORY MANAGEMENT SYSTEM

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ABSTRACT

An Inventory Management System is a software solution designed to help organizations efficiently track, manage, and optimize their inventory operations. It streamlines key processes such as product tracking, order management, sales processing, and inventory control. The system monitors stock levels, locations, and item details, ensuring accurate real-time inventory tracking. It also facilitates sales transactions by recording product quantities, prices, and customer information while maintaining procurement details like vendor orders, delivery schedules, and supplier coordination. Additionally, Inventory Management System generates reports for data-driven decision-making and integrates with other business systems to enhance operational efficiency. By simplifying complex inventory management tasks, an Inventory Management System enables businesses to reduce stock shortages, improve workflow automation, and ensure seamless inventory handling.

INTRODUCTION

Inventory management is a critical component of any organization involved in the storage, distribution, or sale of physical goods. It plays a central role in ensuring operational efficiency, cost control, and customer satisfaction. Traditional inventory management methods, often reliant on manual tracking and paper-based systems, have presented significant challenges including data inaccuracies, stockouts, overstocking, and inefficient resource utilization.

This project explores the transition from manual to automated inventory management systems, highlighting their benefits, operational implications, and potential for future development. Through a detailed analysis, we demonstrate how automation in inventory management can revolutionize supply chain operations, minimize waste, and significantly enhance organizational performance.

WEB DEVELOPMENT

In the digital era, the internet serves as the backbone of global communication, business operations, and information dissemination. Web development plays a crucial role in enabling seamless user experiences across various platforms. From robust inventory dashboards to real-time tracking systems and intuitive user interfaces, web development is central to the design and functionality of inventory management solutions. The field continues to evolve rapidly, incorporating technologies such as cloud computing, responsive design, and integrated APIs to support efficient and scalable web-based systems.

OBJECTIVE

The primary objective of this project is to develop a web-based inventory management system that ensures accurate tracking, streamlined operations, and enhanced control over stock levels. The system is intended to address common inventory challenges such as overstocking, stockouts, and data inaccuracies. The key objectives include:

- **Streamlined Inventory Operations:** Automate stock tracking and item movement to reduce manual workload and errors.
- **Accuracy and Transparency:** Maintain up-to-date and precise inventory records accessible in real time.
- **Improved Security:** Restrict access to sensitive inventory data through user authentication and role-based permissions.
- **Enhanced User Experience:** Provide an intuitive, user-friendly interface for both administrators and staff to manage inventory efficiently.

AUTOMATED INVENTORY MANAGEMENT SOLUTIONS

Case studies offer invaluable insights into real-world implementations, particularly in inventory management solutions. By analyzing successful applications of automated systems in diverse industries, case studies help identify the challenges and strategies that led to operational success. These real-world examples help businesses understand key factors that contribute to system efficiency, providing a practical roadmap for others seeking to automate their own inventory systems.

AUTHENTICATION IN INVENTORY MANAGEMENT SYSTEMS

In the realm of inventory management, the security of data and transactions is paramount. As cyber threats evolve, traditional security measures such as passwords may no longer be sufficient to safeguard sensitive inventory data. Biometric authentication, such as fingerprint or facial recognition, offers a higher level of security. Unlike passwords, which can be shared or forgotten, biometric data is unique to each individual, significantly reducing the likelihood of unauthorized access. Though promising, biometric systems present challenges, particularly around privacy concerns and the complexity of implementation. Balancing security with ease of use will be critical as inventory systems become increasingly digitized.

COST-EFFECTIVENESS ANALYSIS IN INVENTORY MANAGEMENT SYSTEMS

Implementing automated inventory management systems often requires significant upfront investments in software, infrastructure, and staff training. However, the potential long-term cost savings and efficiency improvements often outweigh the initial costs. These systems reduce the need for manual data entry, mitigate the risk of stock discrepancies, and improve real-time tracking. This, in turn, reduces operational inefficiencies, labor costs, and inventory shrinkage.

DESIGN AND IMPLEMENTATION OF A CASHLESS PAYMENT SYSTEM IN INVENTORY MANAGEMENT

RFID (Radio-Frequency Identification) technology has become a cornerstone of modern inventory management, allowing businesses to track products and manage stock levels automatically. With RFID, each product is tagged with a unique identifier, and its movement can be tracked in real-time. The integration of RFID technology streamlines stocktaking processes, reduces human error, and minimizes the need for manual intervention.

While RFID requires a substantial investment in hardware and training, its long-term benefits—such as reducing labor costs and improving inventory accuracy justify the initial costs. User adoption, however, can be a challenge, especially for smaller businesses, which may require ongoing education and support to fully leverage RFID technology.

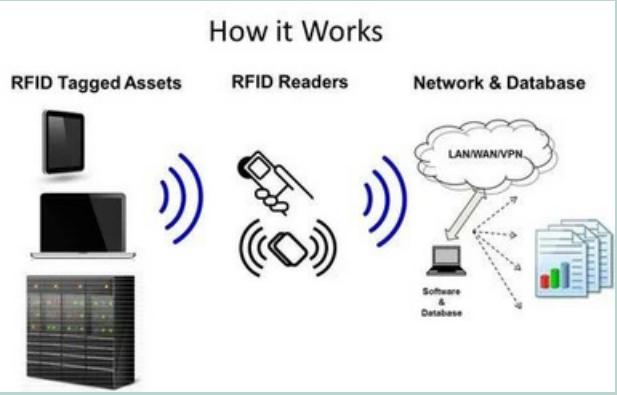


Figure: Working of RFID

AUTOMATED INVENTORY BILLING USING QR CODE TECHNOLOGY

For automated inventory management, QR codes offer a practical solution for tracking product movement and processing transactions. By linking products to unique QR codes, businesses can scan these codes to instantly update inventory records and monitor stock levels. This solution is cost-effective, leveraging widely available smartphones for product identification and transaction management.

INVENTORY MANAGEMENT: IoT AND CLOUD COMPUTING

The integration of IoT (Internet of Things) devices and cloud computing is revolutionizing inventory management systems. IoT sensors can automatically track inventory levels, detect discrepancies, and send alerts when restocking is needed. These devices communicate with cloud-based platforms, where data is stored, processed, and analyzed. Cloud computing allows inventory systems to scale with business needs, providing the flexibility to manage varying stock levels without requiring additional physical infrastructure. Data accessibility from anywhere also empowers managers to make informed decisions on procurement and stock management. However, smaller businesses may face challenges in implementing and maintaining such systems due to budget constraints and technical complexity.

AUTOMATED INVENTORY MANAGEMENT: CURRENT PRACTICES

In many modern businesses, automated inventory management systems are transforming how stock is tracked and managed. These systems utilize technologies like barcode scanning, RFID, and mobile apps to streamline stock updates and inventory control. Automated systems provide real-time insights into stock levels, reducing errors and enabling better forecasting for procurement and sales.

INVENTORY MANAGEMENT TECHNOLOGY ADVANCES

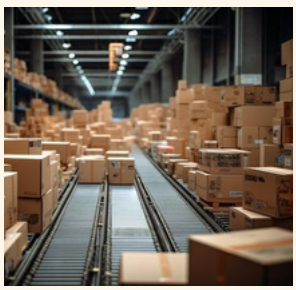
Recent advancements in inventory management technology, including mobile applications, RFID, and automated stock tracking, have significantly improved operational efficiency. These innovations expedite stocktaking processes, reduce human error, and enhance decision-making by providing real-time data. Mobile apps, for example, enable staff to scan products and update inventory records instantly, increasing convenience and accuracy.

INVENTORY STREAMLINING: AUTOMATED SYSTEMS

Automated systems for inventory management are helping businesses streamline processes and reduce manual effort. These systems use advanced technologies to track stock movement, automate restocking processes, and update inventory records in real time. Automated systems enhance operational efficiency by reducing human error and providing accurate, up-to-date information on stock levels.

AUTOMATED INVENTORY MANAGEMENT: EFFICIENCY & EXPERIENCE

The automation of inventory management systems is significantly improving both operational efficiency and customer experience. Automated systems reduce the time spent on stock-taking and manual inventory updates, leading to faster and more accurate processes. Customers benefit from improved service due to better stock availability and faster order processing.



SUMMARY

The integration of automated inventory management systems is reshaping how businesses track and manage stock. These systems provide valuable data insights that enhance operational efficiency, reduce costs, and improve decision-making. By automating routine tasks such as stock tracking, order processing, and restocking, businesses can free up valuable resources for more strategic initiatives.As technology continues to evolve, the role of automated systems in inventory management will only grow, offering businesses new opportunities to optimize their operations and stay competitive in the marketplace.

X-RAY IMAGE ENHANCEMENT USING IMAGE PROCESSING ALGORITHMS

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ABSTRACT

X-ray imaging plays a vital role in medical diagnostics, but its quality is often degraded by noise, artifacts and distortions. It presents an advanced framework for enhancing X-ray images using multiple image processing techniques. The proposed approach incorporates histogram-based contrast enhancement, contrast-limited adaptive histogram equalization, unsharp masking, high-frequency emphasis filtering and wavelet-based enhancement are applied sequentially to improve contrast, suppress noise and enhance fine details. In order to accelerate processing, parallel computing and Graphics Processing Units are utilized to ensure efficient performance. Experimental results indicate a notable improvement in X-ray image quality, demonstrating the potential of advanced processing methods in radiological analysis. The system contributes to the advancement of X-ray imaging techniques, ultimately aiding in more accurate medical diagnoses and better patient care.

INTRODUCTION

IMAGE PROCESSING

Image processing is a branch of computer vision, involves techniques for manipulating and analyzing digital images to extract meaningful information or enhance visual quality. It utilizes algorithms to process images in various ways, such as filtering, segmentation, edge detection and transformation, enabling applications in diverse fields. Image processing can be broadly classified into two types namely digital and analog image processing.

Feature extraction identifies key characteristics such as edges, textures and shapes. Image processing techniques are widely used in medical imaging, satellite imagery, biometric authentication, robotics and Augmented Reality (AR).

COMPUTE UNIFIED DEVICE ARCHITECTURE (CUDA)

CUDA is a parallel computing platform and Application Programming Interface (API) developed by NVIDIA, enabling Graphics Processing Units (GPU) to accelerate computational tasks. It allows developers to harness the massive parallel processing power of GPUs for general-purpose computing, significantly improving performance in tasks like scientific simulations, deep learning and image processing. CUDA provides a programming model that extends languages, allowing developers to write highly parallelized code for execution on NVIDIA GPUs. CUDA architecture consists of thousands of small cores capable of executing multiple threads simultaneously, making it well-suited for high-performance computing applications. Key components include CUDA threads, blocks and grids, which defines the hierarchical execution model and memory types like shared memory, global memory and constant memory, optimized for different levels of performance. CUDA has revolutionized fields such as Artificial Intelligence (AI), real-time rendering and bioinformatics by significantly reducing computation CPUs.

OBJECTIVE

The objective of the project is to improve X-ray images, which is essential for effective image enhancement and segmentation. Enhancement techniques, such as noise reduction and contrast adjustment, improve the visual quality of images, making anatomical structures and abnormalities clearer for interpretation. It helps medical professionals identify subtle details that may otherwise be overlooked. Segmentation further aids diagnostics by isolating specific regions or structures, such as organs or lesions, allowing targeted analysis and more accurate assessments. Techniques like thresholding, region growing and deep learning-based methods ensure precise delineation of areas of interest, facilitating effective and reliable medical evaluations.

ENHANCING THE RESOLUTION OF CHEST X-RAY IMAGES WITH SRGAN and SUB-PIXEL

K. L. Reddy et al. proposed the use of SRGAN and ESPCN to improve the resolution of chest X-ray images using deep learning-based super-resolution techniques. The approach addresses the limitations of low-resolution medical imaging by enhancing image quality to support better diagnostic accuracy. The Authors used the modified version of ESPCN for further refinement. Bicubic interpolation to down sample images before applying the super-resolution models. Performance was evaluated using PSNR and SSIM, showing that both SRGAN and ESPCN significantly enhance image clarity. This improvement enables radiologists to detect fine abnormalities with greater precision and supports applications in telemedicine, AI-driven disease detection, and medical education. Among the two algorithms SRGAN was more effective in preserving structural details, making it preferable for medical imaging tasks making it more effective for medical imaging applications.

MULTI-MODAL GRAPH LEARNING FOR ENHANCED DISEASE PREDICTION

S. Zheng et al. proposed a technique called Multi-modal Graph, which explores graph-based AI for integrating clinical records and imaging data. The study emphasizes interpretable AI models for clinical decision-making and highlights complex interrelations between modalities and introduces Graph Neural Networks (GNNs) to improve disease prediction accuracy. The framework enhances risk stratification and prognosis analysis by leveraging cross-domain correlations. It also tackles data noise and missing values, ensuring robust medical AI applications. Applications include personalized medicine, automated diagnostics and healthcare analytics. Results indicate improved diagnostic accuracy using multi-modal fusion.

MARGIN PRESERVING SELF-PACED CONTRASTIV LEARNING

Z. Liu et al. proposed the algorithm of margin-preserving self-paced contrastive learning to address domain adaptation challenges in medical image segmentation. The method improves segmentation performance across varying imaging datasets by preserving margin constraints and enabling consistent predictions across domains. It adopts a self-paced strategy, allowing models to first learn simpler examples before gradually incorporating complex cases. This improves robustness, especially in scenarios with limited labeled data. Evaluated using the Dice coefficient, the approach shows notable improvements in segmentation accuracy. The study emphasizes the importance of semi-supervised learning in medical imaging, with applications in multi-organ segmentation and cross-domain disease detection.

TWO-STAGE RESIDUAL CNN FOR TEXTURE DENOISING AND STRUCTURE ENHANCEMENT ON LOW-DOSE CT IMAGE

L. Huang et al. proposed a two-stage residual CNN algorithm for texture denoising and structure enhancement in low-dose CT images. The approach focuses on preserving textures while enhancing structural details and reducing noise in CT scans. The proposed method effectively maintains critical diagnostic features and outperforms traditional filters in low-dose imaging scenarios. The work underscores the importance of the approach in minimizing radiation exposure during CT procedures.

UNSUPERVISED MRI RECONSTRUCTION VIA ZERO-SHOT LEARNED ADVERSARIAL TRANSFORMERS

Y. Korkmaz et al. proposed an unsupervised MRI reconstruction algorithm using zero-shot learned adversarial transformers. This approach leverages zero-shot learning to enhance MRI quality without the need for labeled data by applying adversarial transformers, the method generates high quality reconstructions, significantly improves the low-resolution MRI scans particularly in data-scarce environments. The results demonstrate notable performance gains over conventional reconstruction techniques.

PROPOSED SYSTEM

CUDA-based acceleration can significantly enhance X-ray processing by addressing slow processing speeds and inadequate real-time performance. By leveraging parallel computing capabilities of GPUs, medical image processing can be performed much faster than traditional CPU-based methods. Advanced noise reduction and contrast enhancement algorithms can be implemented using CUDA to improve image clarity. These optimizations help in detecting subtle abnormalities more accurately, leading to better diagnostic precision. Real-time image analysis becomes feasible, allowing instantaneous medical evaluations and faster clinical decision-making. CUDA's efficient memory handling and computational speed ensure smooth performance in large-scale medical imaging applications. Enhanced processing speed also facilitates telemedicine and remote diagnostics, improving accessibility to healthcare. The technology supports deep learning-based enhancements, making AI-powered medical imaging more effective. Optimized X-ray processing improves workflow efficiency in hospitals, reducing delay in patient care.

RESULTS AND DISCUSSION

In order to improve visibility and detail extraction in various image enhancement techniques applied to the X-ray image demonstrate significant improvements in visibility and detail extraction. The original image exhibits low contrast, making it difficult to analyse finer structures. Histogram Equalization enhances global contrast by redistributing intensity values, while CLAHE refines this approach by limiting contrast amplification in localized regions. Unsharp Masking sharpens the image by blending it with a blurred version, improving edge details. High-Frequency Emphasis Filtering enhances fine structures by amplifying high-frequency components. Finally, the Wavelet Transform decomposes the image into different frequency levels, providing a multi-scale enhancement approach. These techniques collectively improve the clarity of X-ray images, aiding in more accurate medical diagnoses.

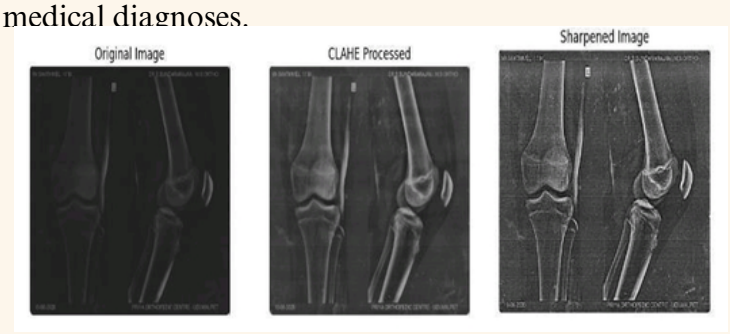


Figure: Result of Image Enhancement Techniques

The above images shows the progression of X-ray image enhancement using different techniques. The original image appears dark with low contrast, making anatomical structures difficult to distinguish. The CLAHE processed image (center) demonstrates improved local contrast, revealing more bone detail and structure. The sharpened image right further enhances edges and fine textures, providing greater clarity and definition, which can aid in more accurate medical diagnosis.

CONCLUSION

The proposed algorithm improves the visibility of anatomical structures, aiding in better diagnosis and interpretation of medical images and refines image details by preserving important high-frequency components. The project demonstrates the effectiveness of image enhancement techniques in medical diagnostics, providing a foundation for improving automated analysis in radiology.

AI-POWERED INTELLIGENT BUS TRACKING FOR ACADEMIC INSTITUTIONS

Ragavarthini M

727623BCS039

INTRODUCTION

In academic institutions, transportation is an essential component of daily logistics, particular for students and staff who rely on buses to commute to and from campus.. This project introduces an AI-based intelligent bus tracking and alert system designed specifically for institutional use. It leverages real-time GPS data, mobile application integration, and smart algorithms to improve the efficiency and reliability of institutional transportation services.

ABSTRACT

The aim of this project is to develop an AI-powered transportation system that allows institutions to track their buses in real time, notify users of arrivals or delays, and streamline communication between drivers, administrators, and commuters. The system is composed of three primary components: a user module that provides real-time bus location and alerts through a mobile app, a driver module that transmits live location updates using GPS, and an admin module that enables schedule management and overall monitoring. Built with Android technologies and cloud-based services, the system is designed to minimize waiting time, reduce uncertainty, and improve safety.

PROBLEM STATEMENT

Institutions often face major challenges in managing their transport systems due to a lack of real-time monitoring, delayed communication, and poor scheduling. Students and staff commonly experience uncertainty regarding bus timings, especially during peak hours or unforeseen delays. Administrators, on the other hand, lack tools to properly track vehicles, manage driver performance, or adapt schedules in real time. This project aims to solve these problems by introducing an intelligent tracking and alert system that ensures real-time information sharing and efficient management of institutional
bus services.

OBJECTIVE

The primary objective of the project is to develop a smart bus tracking and notification system that addresses the existing issues in institutional transportation. It aims to offer real-time location tracking to users through a mobile interface, enabling students and staff to view accurate bus positions and estimated arrival times. Another goal is to provide automated alerts regarding delays, arrivals, and departures to minimize confusion and waiting time.

For the administrative side, the project includes tools for monitoring schedules, managing driver profiles, and analyzing operational data. Overall, the project is designed to improve safety, enhance commuter satisfaction, and optimize transport management using intelligent tools.

MODULE

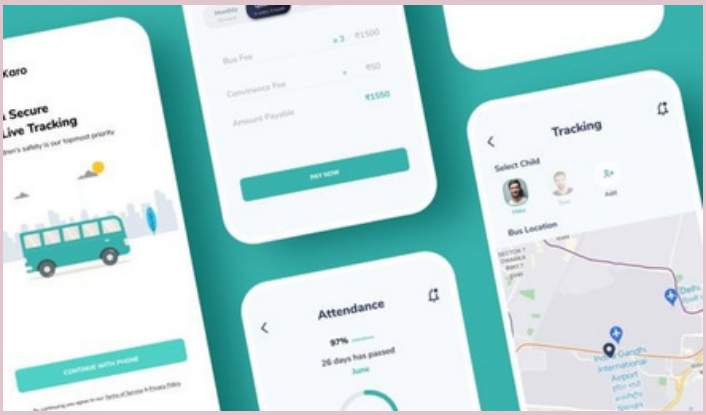
The system is structured into three interconnected modules, each playing a vital role in the overall functionality. The user module is built for students and staff, offering a mobile interface where users can track the real-time location of buses and receive alerts related to their arrival or delays. The driver module operates from the bus end, where drivers use the app to share live location data via GPS, ensuring the system has up-to-date movement information.

TECHNOLOGIES USED

To bring this intelligent system to life, a combination of modern software and cloud technologies has been employed. Android Studio is used for developing the mobile application for both users and drivers, using Java or Kotlin for the frontend. Firebase serves as the cloud backend, offering real-time database services, authentication, and notification capabilities. The Google Maps API is integrated into the app to visualize bus movements on a map and provide location data. AI algorithms are also embedded into the backend to predict delays, calculate estimated arrival times, and automate alerts.

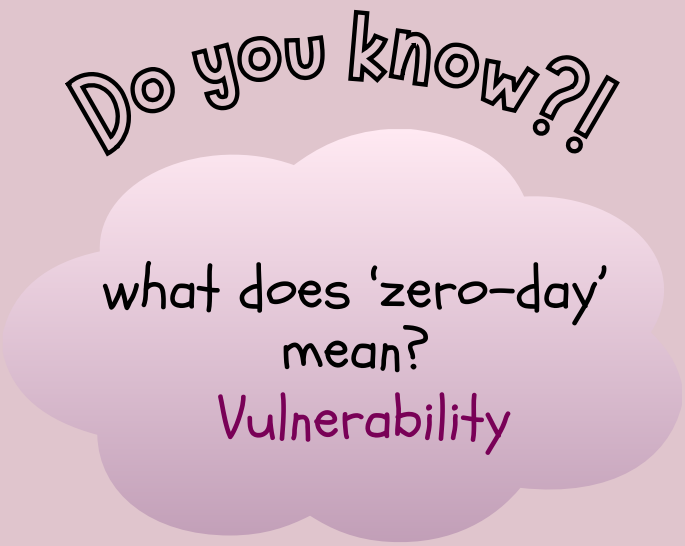
ADVANTAGES

The system offers numerous benefits that directly address the limitations of traditional institutional transport. For users, the real-time tracking and automated alerts ensure that they no longer have to wait blindly or miss buses due to uncertainty. The platform promotes safety by keeping commuters informed and connected. For administrators, the centralized system allows for effective schedule management, performance monitoring, and operational oversight. It also reduces the need for manual coordination and lowers the chances of communication errors. Additionally, the use of cloud and AI technologies ensures scalability, meaning the system can be easily adapted to larger institutions or even public transportation networks.



CONCLUSION

This project successfully demonstrates how artificial intelligence and mobile technologies can be harnessed to modernize institutional transport systems. By offering real-time bus tracking, predictive alerts, and centralized administrative control, the system addresses long-standing issues such as delays, inefficiency, and communication breakdowns. It not only improves commuter satisfaction and safety but also streamlines the transport management process.



CHALLENGES FACED

While developing the system, several technical and practical challenges were encountered. One of the major issues was the inconsistency of GPS signals, especially in urban areas or enclosed spaces, which sometimes affected tracking accuracy. Another challenge was ensuring continuous internet connectivity across all modules, as real-time updates depend heavily on reliable network access. Synchronizing live data between drivers, users, and the admin panel also posed a challenge, particularly in handling delays and rapidly updating interfaces. Despite these hurdles, careful system design and testing helped mitigate most issues and ensured a functional and efficient final product.

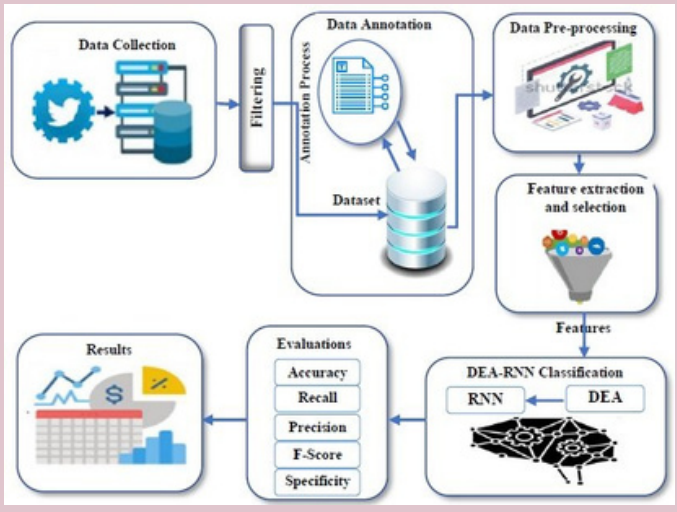


Figure: Data processing

STOCK PREDICTION USING LSTM AND RNN MACHINE LEARNING ALGORITHM

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ABSTRACT

Stock market prediction is a challenging task due to its volatile and complex nature. Traditional models often fail to capture long-term dependencies and nonlinear patterns in stock prices. This project enhances forecasting accuracy using deep learning techniques, specifically Long Short-Term Memory (LSTM) and Recurrent Neural Networks (RNN).

The system integrates historical stock data, technical indicators, and market sentiment for improved performance. Data preprocessing, feature engineering, and model training are performed using Google Colab, while Anvil is used for interactive web-based visualization. A comparative analysis with ARIMA and Random Forest highlights the advantages of deep learning in delivering reliable stock market predictions.

INTRODUCTION

Stock markets play a vital role in the global economy, influencing investment decisions and financial planning. However, predicting stock prices is complex due to their highly volatile and nonlinear nature. Traditional models like ARIMA often fail to capture deep patterns in time-series data. This project proposes the use of Long Short-Term Memory (LSTM) networks, a type of Recurrent Neural Network (RNN), to improve prediction accuracy. LSTMs are effective in learning long-term dependencies and trends from historical stock data. By integrating technical indicators and economic factors, the system aims to provide more accurate forecasts, helping investors make better-informed decisions.

MACHINE LEARNING

Machine Learning (ML), a branch of artificial intelligence, enables systems to learn from data without explicit programming. In stock market prediction, ML models analyze historical data to identify patterns and forecast future prices. Traditional models like ARIMA assume linear relationships and often require domain expertise, limiting their effectiveness with complex, non-linear data. Deep learning models, particularly Long Short-Term Memory (LSTM) networks, overcome these limitations by learning from large sequential datasets and capturing long-term dependencies. LSTMs are well-suited for financial time-series forecasting, offering improved accuracy. Integrating ML with financial data enhances predictions and reduces human bias in decision-making.

OBJECTIVES

This project builds a stock price prediction system using LSTM networks, improving accuracy with technical indicators and economic data. It uses hyperparameter tuning for optimization and supports real-time forecasting, comparing results with models like ARIMA and Random Forest.

PROBLEM STATEMENT

Stock market prediction is difficult due to high volatility, noise, and the complex nature of financial data. Traditional models often fail to capture long-term patterns and nonlinear relationships, relying on manual feature engineering and assumptions that limit accuracy. This project tackles these issues using Long Short-Term Memory (LSTM) networks, which can learn long-term dependencies and handle non-linear trends. By integrating multiple data sources and advanced ML techniques, the project aims to build a more accurate and reliable stock price prediction system than traditional methods.

LITERATURE SURVEY

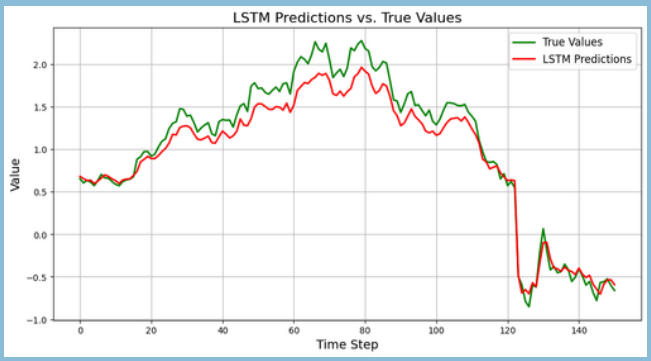

Figure: Implementation

Recent research highlights the effectiveness of Long Short-Term Memory (LSTM) networks in stock market prediction. A 2023 study introduced a hybrid LSTM model combined with sentiment analysis, utilizing news and social media data to enhance predictive accuracy. Another work (2019) focused solely on LSTM networks, demonstrating their superiority over traditional models like ARIMA and SVM in capturing long-term trends in stock data. A 2020 study used sentiment analysis with machine learning models such as Naïve Bayes and Random Forest, showing improved accuracy by combining qualitative and quantitative data. Additionally, integrating technical indicators (e.g., RSI, moving averages) with LSTM was found to improve model context and performance. Ensemble methods (2017) that combine multiple ML models, including LSTM, were shown to be more robust against noisy data. A 2021 study explored multi-source data integration, emphasizing the value of combining financial indicators with sentiment and historical data. Lastly, a 2019 review supports the use of deep learning models like LSTM and CNN for financial forecasting due to their ability to model non-linear stock behaviors.

EXISTING SYSTEM

Existing stock prediction systems use traditional statistical models (like ARIMA), technical indicators (SMA, EMA, RSI, MACD), sentiment analysis (from news and social media), and machine learning models (such as SVM, Random Forest, Gradient Boosting). These systems follow a methodology involving data preprocessing, feature extraction, statistical modeling, and sentiment integration. However, they face key limitations:

- Inability to model non-linear and sudden market behaviors
- Poor handling of temporal dependencies
- Risk of overfitting in ML models
- Limited accuracy in real-time and volatile markets

To address these challenges, the proposed system will adopt LSTM networks for sequential pattern learning and incorporate transformer-based models (e.g., RoBERTa) and data augmentation for improved prediction accuracy and robustness.

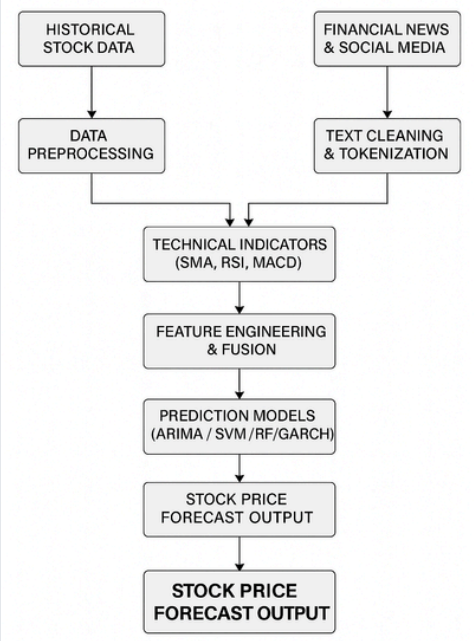

Figure: Working

PROPOSED SYSTEM

The proposed stock prediction system utilizes deep learning techniques, specifically LSTM (Long Short-Term Memory) and RNN (Recurrent Neural Network), to predict stock prices more accurately than traditional methods. By leveraging historical stock data and technical indicators (e.g., Moving Averages and Relative Strength Index), the model captures long-term dependencies and trends in the stock market. Data is collected from real-time sources like Yahoo Finance and Alpha Vantage APIs, preprocessed, and normalized using MinMaxScaler. The LSTM and RNN models are trained in Google Colab, and the system provides real-time predictions through a web interface built with Anvil. This user-friendly tool helps investors make informed decisions by forecasting stock prices with high accuracy. Performance is evaluated using metrics like RMSE and R^2 to ensure reliable predictions.

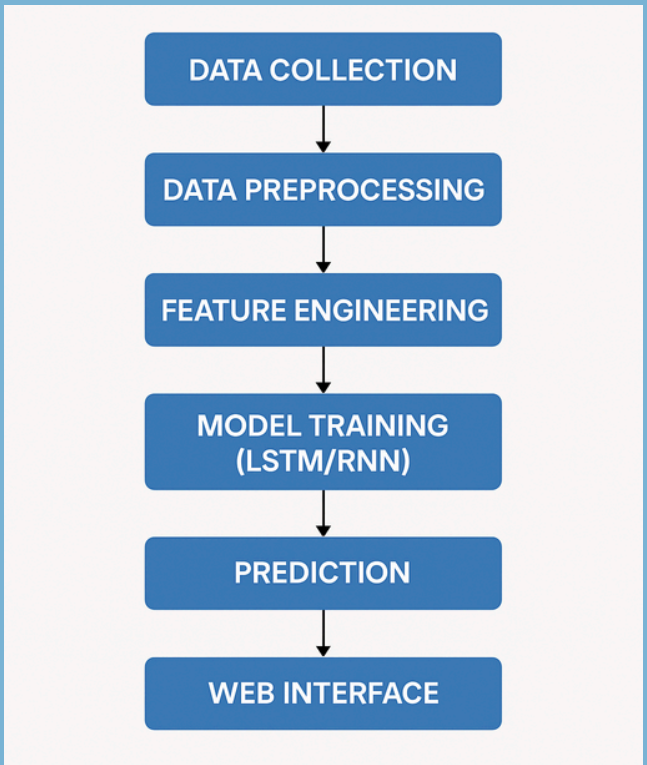

Figure: The process

IMPLEMENTATION SETUP

This project focused on predicting stock prices using an LSTM-based deep learning model. Stock market data, including prices, volume, and financial indicators, was sourced from Yahoo Finance and Alpha Vantage APIs. Python, along with libraries like TensorFlow, Keras, scikit-learn, Pandas, and NumPy, was used for model development, data manipulation, and visualization. The data was pre-processed using MinMaxScaler and split into training and testing sets. The model, built using LSTM and RNN layers, was trained in Google Colab, where performance was evaluated using metrics like RMSE, MAPE, and R^2, showing high accuracy. Predictions were then visualized using Matplotlib and Seaborn. A web interface built with Anvil allowed users to interact with the model and view real-time stock predictions. The project demonstrated the efficacy of LSTM for time-series forecasting and provided a practical, user-friendly stock prediction system.

CONCLUSION

The proposed stock prediction system effectively forecasts stock prices using deep learning models like LSTM and RNN. By integrating real-time financial data and technical indicators, it outperforms traditional models in accuracy. The system supports informed investment decisions through reliable predictions and a user-friendly interface. Its three-layer architecture ensures efficient data processing and forecasting, with performance validated through key evaluation metrics.

LANDSLIDE PREDICTION USING MACHINE LEARNING

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ABSTRACT

Landslides pose significant threats to human lives, infrastructure, and the environment, particularly in regions vulnerable to heavy rainfall, deforestation, and unplanned development. Traditional landslide prediction methods often suffer from limited accuracy, poor data integration, and delayed responses, which hinder timely and reliable disaster management. To overcome the limitations of existing methods, this project introduces a real-time landslide prediction and early warning system that integrates advanced geospatial data processing, multi-source satellite imagery, and machine learning (ML) techniques. The proposed system significantly enhances disaster preparedness by offering timely, actionable risk assessments that improve decision- making for both authorities and at-risk populations.

OVERVIEW OF THE XGBOOST SYSTEM

The landslide prediction and severity mapping system integrates satellite imagery, numerical datasets, and machine learning for accurate risk assessment. The architecture involves data collection from sources like Sentinel-2, Landsat-8, SRTM, and OSM, followed by preprocessing (e.g., cloud masking, NDVI calculation). Feature extraction focuses on key parameters like altitude, slope, rainfall, and land use. Machine learning models (Random Forest, XGBoost) analyze these features to generate landslide risk maps.

A layer-based approach integrates terrain, vegetation, hydrology, and infrastructure factors for enhanced accuracy. Data preprocessing involves standardizing multiple sources, extracting areas of interest, and formatting data for model training. The system uses QGIS and Google Earth Engine for analysis, ensuring reliable landslide prediction and decision-making support.

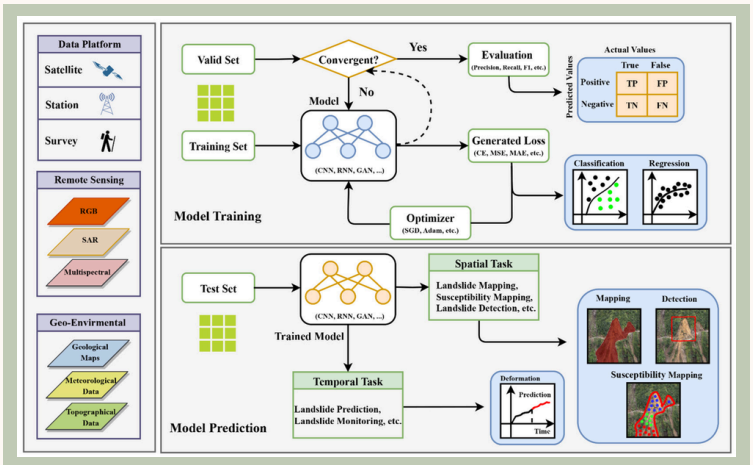


Figure: Using Deep learning

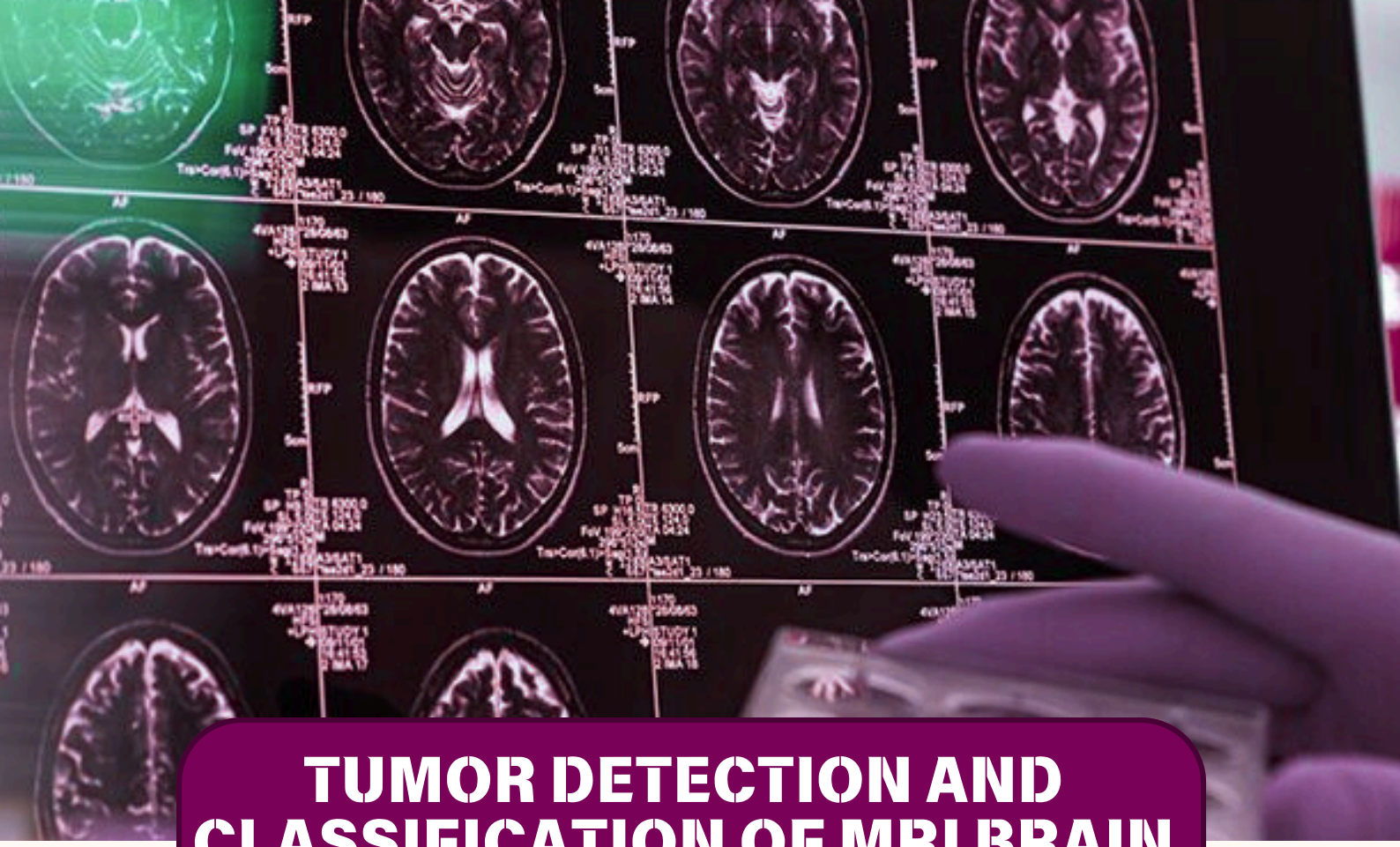
MODEL TRAINING FOR PREDICTION AND SEVERITY

Model training involves using the extracted features to train machine learning algorithms for landslide prediction. The processed datasets, including satellite imagery, soil properties, rainfall data, and terrain features, are split into training and testing sets. In this stage, supervised learning techniques, such as decision trees, random forests, or support vector machines, are applied to the training data to identify patterns and relationships between the features and landslide occurrences. once the model is trained, it can predict potential landslide-prone areas based on new, unseen data, ensuring its applicability for real-time analysis. The Random Forest model is a powerful machine learning algorithm used in landslide prediction due to its ability to handle complex, non-linear relationships among features like slope, NDVI, rainfall, and soil moisture. By constructing multiple decision trees and combining their predictions, it achieves high accuracy, robustness to overfitting, and effective integration of diverse data sources. It also provides feature importance insights, helping identify critical contributors to landslide risk. While computationally intensive and less interpretable than simpler models, its scalability and reliability make it ideal for estimating landslide probabilities and classifying areas into risk levels, ensuring robust predictions in this critical domain.

The XGBoost model is a highly efficient machine learning algorithm used for severity prediction in landslide analysis. It leverages gradient boosting to create an ensemble of decision trees, optimizing their performance through weighted corrections of previous errors. In this process, severity levels such as ”low,” ”medium,” and ”high” are determined based on a range of features, including landslide probability, slope, NDVI, and rainfall, after encoding categorical variables and scaling numeric data.

CONCLUSION

The project effectively integrates multi-source data and machine learning models to create a robust system for landslide prediction and risk assessment. By utilizing satellite imagery, spatial data, and numerical datasets, the system constructs a comprehensive dataset that incorporates key landslide risk factors such as rainfall, ndvi, slope, and proximity to infrastructure. The preprocessing phase, which involved cloud masking, band selection, and data normalization, ensured the quality and consistency of the data, making it ready for accurate analysis. Random Forest was employed to predict landslide risks, while XGBoost was used to assess the severity of landslides. Both models performed excellently, with Random Forest achieving an impressive accuracy of 98%. The feature extraction process also played a vital role in model performance, as it identified crucial variables for accurate prediction, ensuring that the system could provide reliable forecasts. The incorporation of diverse data sources and advanced machine learning techniques resulted in a significant improvement in prediction accuracy compared to existing methods. A key feature of the system is its user-friendly interface integrated with a map interface, allowing real-time visualization of risk assessment results. Users can interact with the map to view predictions, which aids in informed decision-making for disaster management. This combination of predictive accuracy and an intuitive map interface is a novel aspect of the project, providing actionable insights that enhance the effectiveness of landslide mitigation strategies scale of all possible landslide prone areas.



TUMOR DETECTION AND CLASSIFICATION OF MRI BRAIN IMAGE USING XCEPTION CNN

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SUDHARSANA A - 727621BCS028

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ABSTRACT

Deep learning, a key area within machine learning, has significantly advanced the field of medical image analysis. In healthcare, it contributes greatly to improving the speed and accuracy of disease diagnosis. One vital use case is the identification and classification of brain tumors through MRI images. Due to the intricate structure of the brain and the severity of such conditions, deep learning techniques ,especially Convolutional Neural Networks (CNNs), are highly effective in examining medical images and delivering reliable results. These models assist healthcare professionals in making quicker and more informed decisions. Despite advancements in medical imaging, manual analysis of brain MRI scans remains time-consuming, subject to human error, and dependent on expert availability. Moreover, differentiating between various types of brain tumors, such as Glioma, Meningioma, and Pituitary tumors, requires a high level of expertise.

This real-time, user-friendly interface supports healthcare professionals in making faster and more informed diagnostic decisions. Overall, the system offers a reliable and accessible tool for assisting early brain tumor detection and improving clinical workflow efficiency.

OVERVIEW OF THE PROPOSED SYSTEM

The proposed system is designed to classify brain tumors from MRI images into four categories: glioma, meningioma, pituitary tumor, and no tumor using advanced deep learning techniques. The system begins with preprocessing the image dataset, including resizing, normalization, and augmentation to enhance model performance. A deep learning model based on the Xception CNN architecture is employed for automatic feature extraction and classification. The Xception model is chosen for its ability to capture complex spatial patterns in MRI scans with high accuracy.

The system is trained and evaluated using key performance metrics such as precision, recall, F1 score, and confusion matrix to ensure reliability. To make the model accessible in real-world clinical settings, a Flask-based web application is developed where users can upload MRI images and receive real-time predictions along with confidence scores. This system supports faster diagnosis, assists medical professionals in treatment planning, and contributes to improved patient care.

The project utilizes the Xception model, a robust deep learning architecture built on depthwise separable convolutions, to achieve high-accuracy brain tumor classification. The system begins by accepting MRI images, which are then resized to match the input requirements of the model. Through its convolutional layers, the Xception model automatically extracts relevant spatial features from the images. These features are used to classify the MRI scans into one of four categories: glioma, meningioma, pituitary tumor, or no tumor. The model is trained using the categorical cross-entropy loss function, and optimization is carried out using the Adam optimizer to enhance training performance.

The effectiveness of the model is assessed using key evaluation metrics such as accuracy, precision, recall, F1-score, and a confusion matrix. Methodology Step 1: Data Collection & Preprocessing The MRI brain scan images are collected from a reliable public dataset (e.g., Kaggle). Each image is labeled based on the tumor type:

- Glioma
- Meningioma
- Pituitary Tumor
- No Tumor (Normal)

Step 1: Preprocessing.
Step 2: Data Augmentation.
Step 3: Model Implementation .
Step 4: Model Training and Evaluation.

The proposed system is a deep learning-based brain tumor detection model that classifies MRI brain scans into four categories: Glioma, Meningioma, Pituitary Tumor, and No Tumor. The model is built using the Xception convolutional neural network (CNN) architecture, trained on a labeled dataset containing thousands of MRI images. To improve performance and generalization, the data is preprocessed through resizing, normalization, and augmented using techniques such as rotation, zooming, and flipping. The system evaluates model performance using metrics like accuracy, precision, recall, F1-score, and a confusion matrix, providing detailed insights into classification effectiveness.

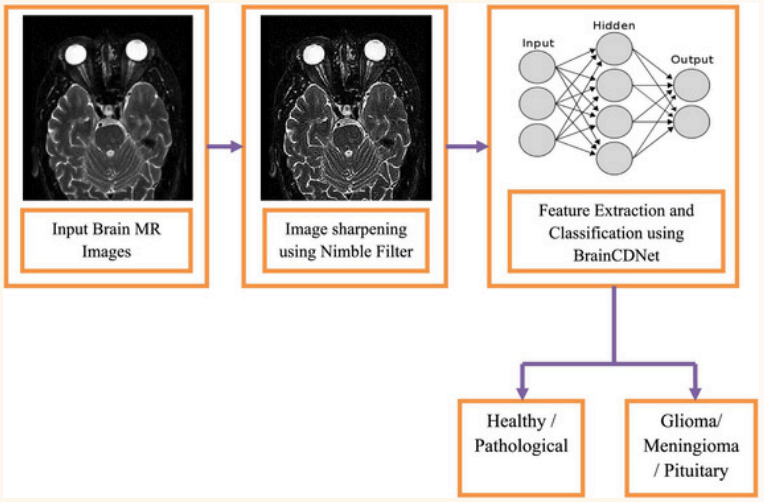

Figure: Detection of Brain Tumors

CONCLUSION

In the proposed system, a machine learning-based future sales prediction system was developed to forecast product sales using historical data. The dataset, sourced from multiple platforms, was preprocessed through techniques like handling missing values, encoding categorical variables, and generating lag and aggregated features to enhance model performance. Advanced algorithms such as LSTM, Random Forest, and XGBoost were implemented and evaluated using RMSE and MAE metrics to identify the most accurate model. The results demonstrated that machine learning models can effectively capture sales patterns and trends, enabling businesses to make informed decisions regarding inventory management, demand forecasting, and strategic planning.

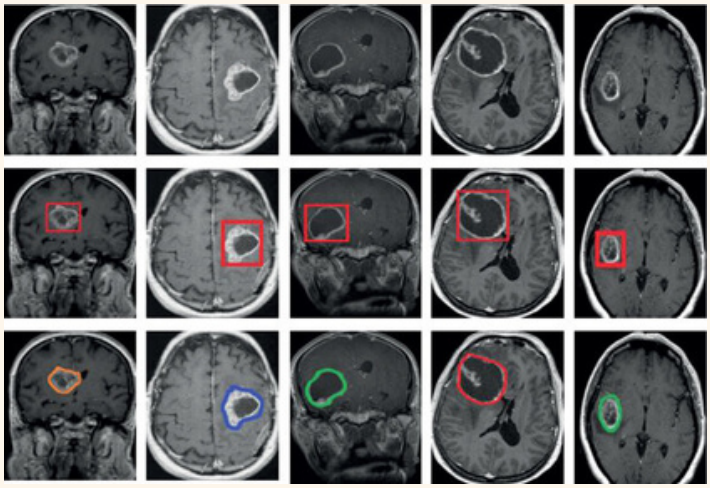

Figure: Sample Scans of Brain Tumor

MOVIE RECOMMENDATION SYSTEM USING MACHINE LEARNING

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BALAJI S - 727621BCS039
NISHANTHINI R- 727621BCS061

ABSTRACT

Movie recommendation systems have become an essential component of online streaming platforms, helping users discover new content that aligns with their preferences. Our proposed system incorporates a combination of sequential pattern mining and rule-based techniques to extract meaningful insights from user interactions. The key contribution of our work is the integration of machine learning algorithms that enhance the accuracy and efficiency of recommendations. To build an effective recommendation model, we first preprocess the dataset by cleaning and organizing the data, removing inconsistencies, and handling missing values. The dataset includes user profiles, movie metadata, and historical interactions. Feature engineering is then applied to extract important attributes that contribute to recommendation accuracy, such as genre preferences, actor-director collaborations, and movie ratings.

INTRODUCTION

In the modern digital landscape, entertainment consumption has evolved significantly, driven largely by advancements in artificial intelligence and machine learning. The system is structured into various modules, each serving a distinct function. The front-end development module handles user interactions, enabling seamless navigation and movie selection.

Streaming platforms, online movie databases, and media services can integrate this technology to enhance customer satisfaction and engagement. Personalized recommendations increase user retention and viewing time, benefiting both service providers and audiences. The scalability of the system also makes it suitable for deployment across various platforms, from web applications to mobile apps, ensuring a seamless experience for users across different devices.

CONTENT BASED RECOMMENDATION SYSTEM

Content-based recommender systems are a fundamental approach in personalized recommendation, leveraging user preferences and item characteristics to generate relevant suggestions. In real-world applications, content-based recommender systems have been successfully deployed across multiple domains. These applications demonstrate the versatility and effectiveness
of content-based recommenders in enhancing user experience and engagement.

RECOMMENDATION SYSTEM MODELS

A recommendation system model is a computational framework designed to predict user preferences and suggest relevant items based on their past behaviors, interests, and interactions.The collected data helps in understanding user preferences and patterns, which serve as the basis for generating recommendations.Machine learning techniques like Principal Component Analysis (PCA) and deep learning-based embeddings are used to extract meaningful features from complex datasets. Recommendation system models can be broadly classified into three categories: content-based filtering, collaborative filtering, and hybrid models.

MOVIE POPULARITY PREDICTION

Movie popularity prediction is a complex task that involves analyzing multiple factors to determine the potential success of a film.One of the most critical factors affecting movie popularity is the cast and crew involved. Well-known actors, award- winning directors, and experienced screenwriters often contribute to the overall appeal of a film.Genre is another important aspect when predicting movie popularity.The theme and storyline of a movie also impact its potential success. A well-structured narrative with compelling characters, strong conflicts, and emotional depth is more likely to resonate with audiences and receive positive word-of- mouth promotion.

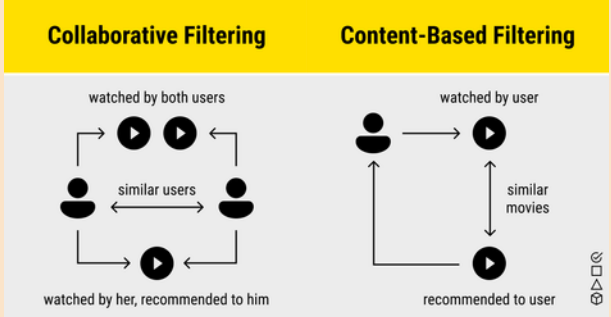


Figure: Filtering process

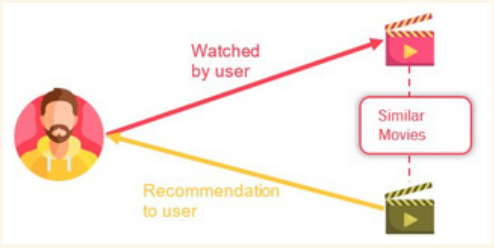


Figure: Movie recommendation

CHALLENGES IN RECOMMENDATION SYSTEM

Recommendation systems play a crucial role in personalizing user experiences across various digital platforms, including e- commerce, streaming services, social media, and online education. One of the most persistent challenges in recommendation systems is the cold-start problem, which occurs when there is insufficient data about new users or items. The dynamic nature of user preferences further complicates recommendation system performance. To address this, recommendation systems incorporate real-time data updates, reinforcement learning, and adaptive algorithms that continuously learn from new user interactions and contextual information.

SENTIMENT ANALYSIS IN MOVIE RECOMMENDATION

Sentiment analysis in movie recommendation is a crucial aspect of modern recommendation systems, enhancing personalized recommendations by understanding audience emotions, opinions, and preferences. One of the fundamental aspects of sentiment analysis in movie recommendation is extracting insights from user-generated reviews. Sentiment-driven recommendation models use techniques like aspect-based sentiment analysis (ABSA) to identify specific elements within reviews, such as acting, direction, and cinematography, helping in creating more refined recommendations based on individual preferences. This level of granularity ensures that recommendations align not only with general sentiment but also with particular aspects of movies that resonate with users.

EXISTING SYSTEM

The existing movie recommendation systems primarily rely on rule-based approaches or popularity metrics to suggest movies to users. Traditional recommendation methods often lack personalization, leading to generic suggestions that may not align with the unique tastes of users. These limitations highlight the need for a more advanced approach, such as collaborative filtering, which can improve accuracy and personalization by analyzing patterns in user behavior.

PROPOSED SYSTEM

The proposed system aims to enhance the movie recommendation process by leveraging collaborative filtering techniques powered by machine learning. External APIs are also integrated to fetch additional movie metadata when necessary, ensuring that users receive up-to-date and diverse recommendations. The recommendation engine employs collaborative filtering to analyze viewing patterns and generate tailored recommendations. The proposed model ultimately delivers a more engaging, dynamic, and personalized movie recommendation experience by continuously refining predictions based on evolving user behaviour.

PREPROCESSING

Preprocessing is a crucial stage in the development of a movie recommendation system using machine learning. These sources may be internal databases, publicly available datasets, or external APIs that provide real-time movie information. The data collected includes movie titles, genres, directors, actors, release years, user ratings, and personal preferences. External APIs such as IMDb, TMDb, or other movie- related repositories play a significant role in augmenting the dataset by providing additional metadata for better analysis.

FEATURE ENGINEERING

Feature engineering is crucial to improving the performance of the recommendation system. It involves creating meaningful features from raw data that enhance predictive accuracy. Feature engineering consists of several key processes, including feature selection, feature extraction, and feature transformation. One of the most commonly used feature engineering techniques is one-hot encoding, which is essential for handling categorical data. For time-series data, feature engineering might involve creating lag features, moving averages, or trend indicators to capture temporal dependencies.

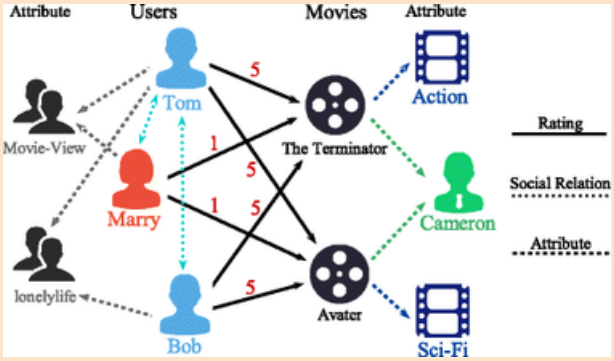


Figure: Relations in movie recommendation

TRADITIONAL RECOMMENDATION SYSTEM

The existing systems for recommendation have primarily relied on traditional approaches such as collaborative filtering, content-based filtering, and hybrid models. Collaborative filtering uses historical interactions between users and items to generate recommendations, identifying similarities in user behavior. It is widely used in platforms like e-commerce and streaming services, where user preferences can be inferred based on past purchases or viewing history. Content-based filtering, on the other hand, focuses on the attributes of items, such as genres, keywords, and descriptions, to make recommendations.

MACHINE LEARNING WITH AI DRIVEN

With the advancement of machine learning and artificial intelligence, existing recommendation systems have evolved to include deep learning models and neural networks. Deep learning techniques such as recurrent neural networks (RNNs) and transformers have improved the ability to capture complex relationships between users and items. Autoencoders and matrix factorization techniques further refine recommendations by reducing dimensionality and learning latent features from sparse interaction data.

REAL TIME PERSONALIZATION AND CONTEXT AWARENESS

Context-aware recommendation systems consider factors such as location, time of day, and user activity to provide more relevant suggestions. Streaming services, for example, recommend content based on recent watch history, while e-commerce platforms suggest products based on browsing behavior. The use of reinforcement learning and adaptive learning models allows recommendations to evolve as users interact with the platform. Despite these advancements, existing systems still face challenges in processing real-time data efficiently, as high computational costs and latency issues impact responsiveness. Furthermore, balancing personalization with user privacy remains a key concern, requiring secure data-handling mechanisms to maintain user trust.

RESULT ANALYSIS MODULE:

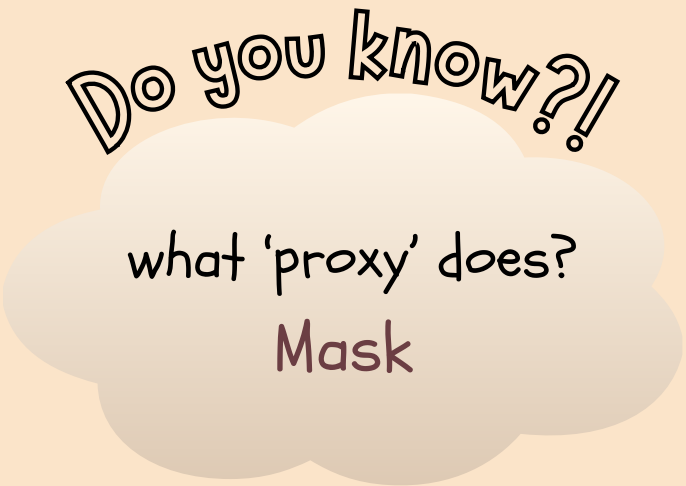
The result analysis of a recommendation system plays a crucial role in evaluating its effectiveness and overall performance. By analyzing the results, developers can refine the model, enhance recommendation accuracy, and improve user satisfaction. In evaluating the recommendation system's performance, real- time user engagement metrics such as click- through rate, dwell time, and conversion rate provide valuable insights.

CONCLUSIONS

The Movie Recommendation System using Machine Learning is a significant advancement in the field of personalized content delivery, enhancing the user experience by offering highly accurate movie suggestions. With further improvements and additional enhancements, such as hybrid recommendation models or deep learning techniques, this project has the potential to revolutionize how users discover and interact with digital content.

FUTURE WORK

The Movie Recommendation System Using Machine Learning involves several areas of improvement and expansion to enhance its accuracy, efficiency, and user experience. Finally, the integration of social and contextual recommendations can make the system even more user-centric. Incorporating social network-based recommendations, where users can see what their friends are watching, or contextual recommendations based on factors like mood, location, or time of day, can create a more dynamic experience. By continually iterating and improving these areas, the movie recommendation system can evolve into a more sophisticated and widely used platform.



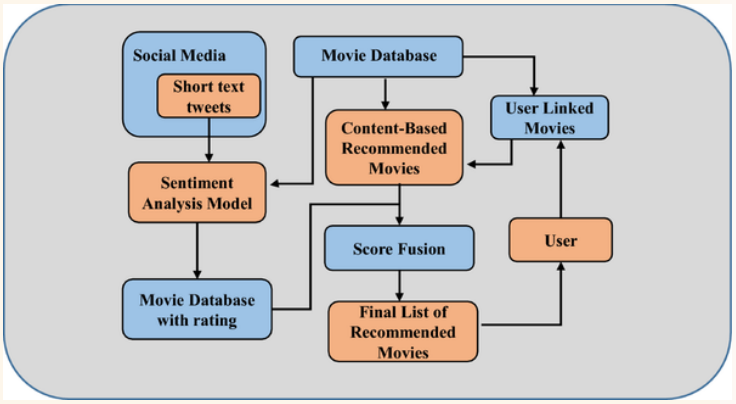


Figure: Integrating Machine learning

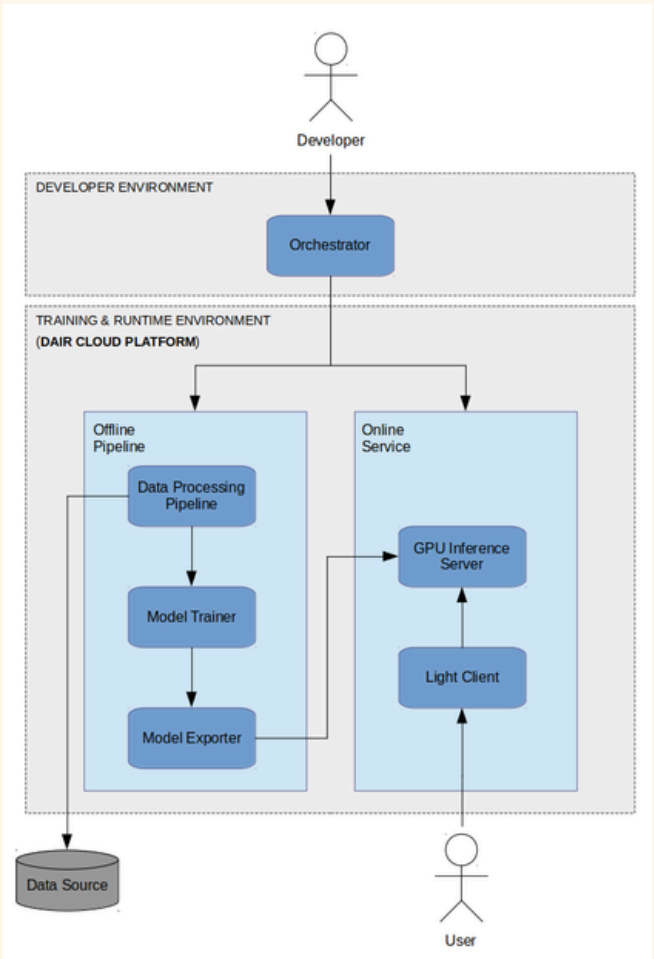


Figure: Simple solution

100 Days Workers Monitoring System Using Geolocation-Based Digital Attendance

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ABSTRACT

The 100 Days Workers scheme, implemented under rural employment initiatives like MGNREGA, provides guaranteed wage employment to citizens in rural areas. However, the current system of manually recording worker attendance through paper logs is time-consuming, error-prone, and lacks transparency. This project introduces a digital solution to streamline attendance monitoring and approval processes by replacing traditional paper logs with a location-based application.. It also enhances accountability and reduces the risk of attendance manipulation. The application supports data export and reporting for administrative review. Future enhancements include offline attendance support, biometric integration, Aadhaar-based worker verification, and centralized dashboards for district-level monitoring. This digital approach promotes transparency, efficiency, and time management in labor tracking, aligning with e-governance objectives and transforming traditional workforce management methods.

INTRODUCTION

The 100 Days Workers program plays a vital role in providing employment to rural populations, but its effectiveness is often hindered by manual attendance tracking and paper-based records. These traditional methods lead to delays, data inconsistencies, and a lack of transparency. To overcome these challenges, this project introduces a digital attendance monitoring system with geolocation-based verification. The system enables supervisors to record attendance on-site using GPS, while HODs can verify and approve entries remotely in real time. By leveraging modern web technologies like React and Firebase, the application ensures accuracy, accountability, and paperless workflow, supporting efficient time and resource management in rural employment programs.

PROBLEM STATEMENT

The current process of monitoring 100 Days Workers relies heavily on manual, paper-based attendance logs, which are prone to errors, manipulation, and delays in verification and wage disbursement. Supervisors record worker attendance without any location-based validation, and Heads of Departments (HODs) must review and approve these records without real-time access or proof of on-site presence. This system lacks transparency, accountability, and efficiency, leading to misuse of resources and administrative burden. Therefore, there is a need for a digital, location-aware application that can streamline attendance marking, enable real-time verification, and reduce dependency on physical records

SYSTEM ARCHITECTURE

The proposed system is a role-based web and mobile application designed to streamline attendance tracking and approval processes for 100 Days Workers. The system consists of two main user roles: Supervisor and Head of Department (HOD). The architecture is built using React for the frontend, Firebase for backend services, authentication, and real-time database storage, and the HTML5 Geolocation API for capturing live location data.

COMPONENTS OF THE SYSTEM

Frontend (Client-side)

- Built with React (for responsive UI).
- Separate views for Supervisor and HOD based on user role.
- Integrated geolocation to capture latitude and longitude at the time of attendance.
- Form inputs for worker details and shift data

Backend (Firebase Services)

- Firebase Authentication for secure login and role-based access.
- Firebase Realtime Database to store attendance records with timestamps and GPS coordinates.
- Firebase Firestore (optional) for structured data if extended features are added.

Geolocation Integration

- Utilizes the HTML5 Geolocation API to fetch the real-time location of the Supervisor when marking attendance.
- Ensures location is within predefined coordinates (can be enhanced with geofencing).

.

Guided by Light

"In the quiet vastness, a lone sail catches the light, proof that even in shadow, direction is found."

727623BCS161

S Samyuktha

Admin Dashboard (HOD Panel)

- Displays submitted attendance entries.
- Allows verification and approval of logs.
- Shows map view (optional) for visual validation of location.
- Enables data export for reporting.

WORKFLOW

Step 1: Supervisor logs in, marks worker attendance, and the system records date, time, and location.
Step 2: Data is synced in real time to Firebase Database.
Step 3: HOD logs in and views pending attendance submissions.
Step 4: HOD verifies geolocation and details, then approves or rejects the entry.
Step 5: Approved data is stored for payroll processing and can be exported as reports.

RESULTS AND DISCUSSION

The implementation of the 100 Days Workers Monitoring System demonstrates significant improvements over the traditional manual attendance process. The developed application was tested with simulated supervisor and HOD roles, incorporating real-time attendance logging and approval workflows. Key functionalities such as geolocation-based attendance, real-time data synchronization, and role-based access performed effectively during testing.

KEY OUTCOMES

Accuracy and Transparency:

Attendance entries captured via the Supervisor's device included automatic timestamps and live GPS coordinates, minimizing the possibility of false reporting.

Efficiency in Workflow:

The approval process by HODs became faster and more reliable, as they could immediately verify entries from any location, reducing delays previously caused by physical form submissions.

Paperless Management:

The complete shift to a digital database eliminated the need for physical registers, contributing to better record management and environmental sustainability.

User Experience:

The interface was kept simple and responsive. Both supervisors and HODs found it intuitive and easy to use, even with limited technical expertise.

DISCUSSION

The integration of geolocation serves as a trustworthy validation layer, making it nearly impossible to forge attendance from outside the worksite. The use of Firebase allowed for secure, scalable, and real-time data handling, which is critical in a multi-user government environment. Moreover, the modular design of the application enables future upgrades, such as offline data sync, biometric verification, or Aadhaar-based worker linking.

However, some limitations were noted:

- The geolocation feature requires internet and GPS access, which may be challenging in remote rural areas.
- Battery usage can be a concern for field supervisors during long hours.
- Reliable network connectivity is essential for real-time updates.

Despite these challenges, the system offers a strong foundation for digitizing rural labor monitoring and can be scaled across departments and districts with minimal adjustments.

CONCLUSION

The 100 Days Workers Monitoring System presents a practical and efficient solution to the long-standing challenges associated with manual attendance tracking and approval in rural employment schemes. By integrating geolocation technology, real-time database systems, and role-based user access, the application ensures accurate, transparent, and paperless attendance management.

The system simplifies the workflow for both supervisors and HODs, enabling faster approvals, reducing administrative burden, and promoting accountability. Its successful implementation demonstrates the potential for digitizing similar government programs, ultimately contributing to improved time management, resource utilization, and governance efficiency.

With future enhancements such as offline support, biometric verification, and Aadhaar integration, the system can be further strengthened and scaled to support large-scale deployment. This project marks a step forward in transforming traditional workforce monitoring methods through accessible and user-friendly digital solutions.

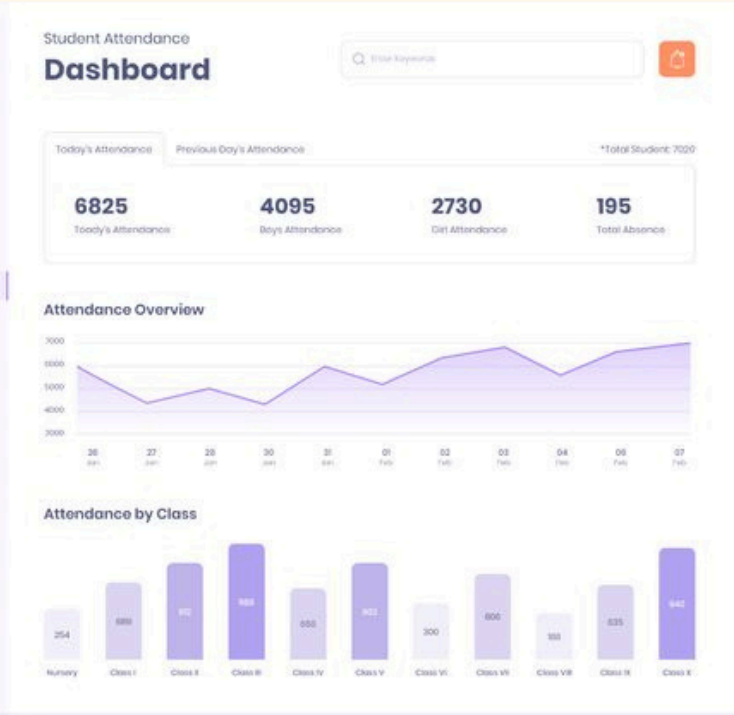
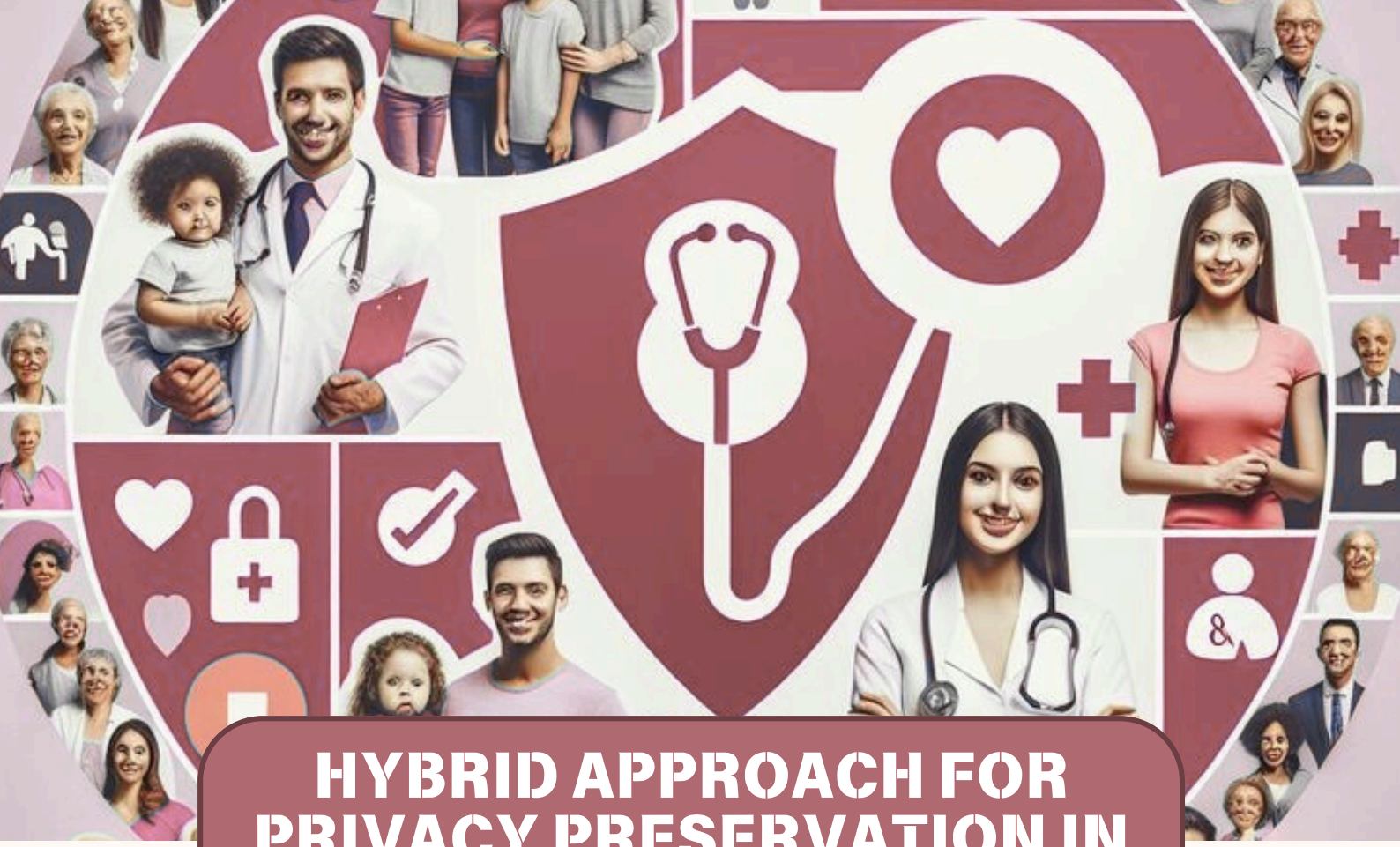


Figure: Sample dashboard



HYBRID APPROACH FOR PRIVACY PRESERVATION IN HEALTH CARE

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ABSTRACT

The growing dependence on digital healthcare records has led to considerable concerns regarding the privacy of patient data. Simple anonymization methods, such as generalization and suppression, often do not work well against modern re-identification risks.While encryption provides strong security, it requires a lot of computing power, making it impractical for large healthcare datasets. A comprehensive privacy approach is presented that sequentially integrates perturbation, k-anonymity, and differential privacy to tackle these issues. Perturbation adds controlled noise to sensitive data, keeping overall patterns intact while hiding individual details. K-anonymity protects identities by grouping similar records so no one can be singled out.The suggested methodology is assessed through a practical healthcare dataset to determine its efficacy in reducing re-identification risk, maintaining data utility, and improving computational efficiency.

INTRODUCTION

The swift growth of digital healthcare data has significantly altered the landscape of patient care, medical research, and decision-making processes. Nevertheless, the extensive adoption of electronic health records (EHRs) brings forth serious concerns regarding the protection of sensitive patient information from unauthorized access and potential exploitation. Conventional security measures, including encryption and basic anonymization, often find it challenging to balance privacy with data usability. Moreover, healthcare organizations bear the responsibility of ensuring data integrity while fostering medical progress. Improper handling of patient information can lead to erroneous diagnoses, misinformation, or biased research findings. Additionally, security breaches can erode public trust, causing patients to be reluctant in sharing essential medical information. This hesitance can adversely affect the quality of healthcare and impede advancements in medical research and innovation.

EXISTING SYSTEM

Healthcare systems rely on data collected from different sources, like electronic health records, cloud-based platforms and wearable devices. While this integration enhances medical research and patient care, it also introduces privacy concerns such as data breaches, identity theft, and unauthorized access. To address these risks, privacy-preserving techniques like K-anonymity are essential in ensuring that patient information remains confidential while still being useful for from at least K-1 others based on selected quasi-identifiers. These quasi-identifiers, such as age, ZIP code, or gender, could lead to identity disclosure if not properly masked. The existing system implements K-anonymity using two key approaches:

DATA GENERALIZATION

This technique replaces particular values with broader categories which blocks individual identification. For example, an exact age of 42 might be generalized to an age range of 40–50 years. This method helps retain the dataset's analytical value while reducing the risk of re-identification.

DATA SUPPRESSION

Suppression removes or hides certain data points when generalization alone does not provide enough privacy. For instance, if a small number of individuals belong to a specific age group, their information may be masked to prevent potential identification.

VALIDATION AND LEARNING APPROACH

The system includes 7 validation tests to identify the effectiveness of K-anonymity by evaluating different levels of data suppression and generalization. Visualization techniques are also incorporated to demonstrate the balance between data privacy and usability.Moreover, expanding interactive learning resources will help make privacy techniques more accessible and user-friendly. research and analysis.

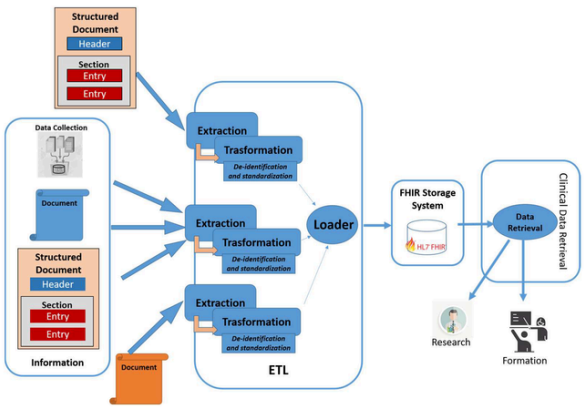


Figure: Privacy based Architecture

Figure: Challenges

K-ANONYMITY IN THE EXISTING SYSTEM

K-anonymity guarantees that each entry in a dataset cannot be distinguished from at least (k-1) other entries based on certain identifying characteristics. Nevertheless, it does not safeguard against the risk of attribute disclosure, which is why supplementary techniques such as differential privacy are frequently utilized.

PROPOSED SYSTEM

The proposed framework incorporates perturbation, K-anonymity, and differential privacy to facilitate secure and confidential sharing of healthcare data. This hybrid strategy amalgamates various privacy-preserving methodologies to bolster data security while preserving its analytical utility. Each component is essential in safeguarding sensitive information and reducing the likelihood of re-identification.

PERTURBATION MODULE

The perturbation technique serves as the initial phase in the anonymization of healthcare data. This module identifies sensitive attributes within the original dataset and introduces random noise to alter the data values. By infusing controlled randomness, perturbation conceals individual specifics, thereby hindering potential attackers from associating records with particular individuals.

Extracting Sensitive Attributes: Recognizes personally identifiable information (PII) and quasi-identifiers that require safeguarding.
Adding Noise to Data: Implements minor alterations to both numerical and categorical values to obscure direct identification.
Maintaining Statistical Integrity: Guarantees that, despite the perturbation, the dataset preserves its overall statistical characteristics for effective analysis.
Perturbation Algorithm
Input: D : Input dataset, N : Numeric noise level , S : String noise level, E : List of columns to exclude
Output: D′ : Perturbed dataset

Function Perturbation(D, N, S, E):
1. Load dataset .
2. Identify numeric and string columns.
3. For each numeric column c in D (excluding E):
a. Add random noise (−N,N) to each value.
4. For each string column c in D (excluding):
a. Randomly modify S× length of characters.
5. Return perturbed dataset D′.

K-ANONYMITY MODULE

The K-anonymity module ensures that every record in the dataset cannot be distinguished from a minimum of K-1 other records when evaluated against quasi-identifiers (QIs). This method prevents unique identification by grouping similar records together, thereby making it more challenging for attackers to target a specific individual.

Identifying Quasi-Identifiers (QIs): Selects attributes such as age, ZIP code, and gender that could facilitate re-identification.
Generalization: Generalization involves substituting precise values with more inclusive categories, such as using age ranges instead of specific ages.
Suppression: Eliminates high-risk values that cannot be adequately anonymized.
K-Anonymity Algorithm
Input: D represents the input dataset, k denotes the k-anonymity threshold, Q is a collection of quasi-identifiers, and G is a dictionary containing generalization intervals.
Output: D signifies the k-anonymized dataset, while P indicates the percentage of data suppression.

FUNCTION K ANONYMIZATION(D,k,Q,G)

1. Load dataset D.
2. Generalize numeric attributes using G.
3. Count occurrences of each quasi-identifier combination.
4. For each row r in D:
o If count of quasi-identifier values <k:
§ Replace quasi-identifier values with '*'.
5. Suppress direct identifiers (e.g., replace 'Hospital' and 'Insurance Provider' with placeholders).
6. Calculate data suppression percentage P.
7. Return anonymized dataset D′ and P.

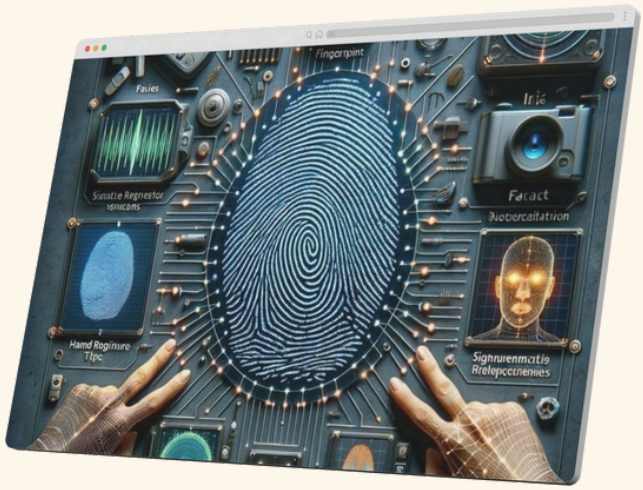
DIFFERENTIAL PRIVACY MODULE

The differential privacy module enhances security by integrating mathematically regulated noise. This approach ensures that the addition or removal of an individual's data does not significantly impact the overall results of the analysis.
Defining Privacy Budget: This step determines the volume of noise to be introduced, achieving a balance between safeguarding privacy and maintaining data utility.
Selecting a Differential Privacy (DP) Mechanism: This involves identifying the appropriate method (such as Laplace or Gaussian noise) for implementing privacy-preserving modifications.
Calculating and Introducing Sensitive Noise: This process bolsters anonymity by ensuring that even if an adversary accesses the dataset, they cannot infer specific information about individuals.

DIFFERENTIAL PRIVACY ALGORTHIM
Input:
· D' → k-anonymized dataset
· ϵ → Privacy budget
· δ → Probability of privacy failure (used for Gaussian noise)
· Q → Collection of quasi-identifiers (excluded from noise addition)
· S→ Sensitivity of numeric attributes
Output:
· D″ → Differentially private dataset

FUNCTION DIFFERENTIAL PRIVACY(D',ϵ, δ, Q,S)

1. Load dataset D′.
2. Identify numeric attributes (excluding quasi-identifiers Q).
3. For each numeric attribute A in D′:
o Compute noise scale
$$\sigma = S \cdot (\text{sqrt2ln}(1.25/\delta)) / \epsilon$$
o Add Gaussian noise N(0,σ) to each value in A.
4. Return the differentially private dataset D″.



PRIVACY-PRESERVED DATA OUTPUT AND DATA MINING

After processing the data through the three modules, the final privacy-preserved dataset is prepared for application. This output can be securely employed in data mining techniques for analysis and research without jeopardizing patient confidentiality.

- **Enabling Secure Data Sharing:** Researchers and healthcare professionals can utilize anonymized datasets without concerns regarding privacy.
- **Supporting Healthcare Insights:** The processed data maintains its analytical significance for medical research, predictive modeling, and informed decision-making.
- **Balancing Privacy and Utility:** Ensures that the dataset remains beneficial for healthcare progress while complying with legal and ethical privacy requirements.

The hybrid methodology presented successfully merges perturbation, K-anonymity, and differential privacy to bolster the security of sensitive healthcare information. By employing a combination of various privacy-preserving strategies, the system guarantees robust anonymization, safeguards against re-identification, and adherence to data privacy regulations. The suggested framework facilitates secure data sharing while preserving the integrity and functionality of healthcare datasets.

RESULT

A hybrid methodology that integrates perturbation, k-anonymity, and differential privacy was utilized on a healthcare dataset. Perturbation involved making slight modifications to both numeric and textual data, ensuring that the overall structure remained intact. K-anonymity was suppress details related to hospitals and insurance, thereby improving privacy.

This strategy successfully safeguards sensitive information while preserving the dataset's utility for analytical purposes. It reduces the risks of re-identification while still allowing for valuable insights. Furthermore, this approach can be adapted to other privacy-sensitive sectors, such as finance, insurance, and government records, thereby ensuring data protection without sacrificing analytical effectiveness.

FUTURE WORK

Future advancements will encompass the integration of blockchain technology to facilitate secure data exchange, the enhancement of differential privacy measures, real-time anonymization techniques, and AI-driven optimization processes. Additionally, there will be an expansion of applications across various sectors, including finance and smart cities, alongside the implementation of automated compliance systems and user-controlled privacy settings to foster increased trust and transparency.

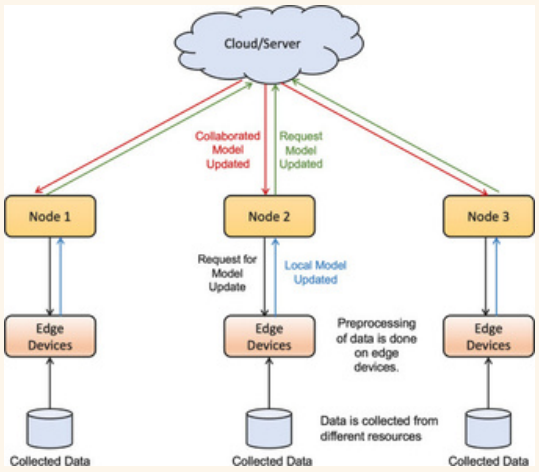
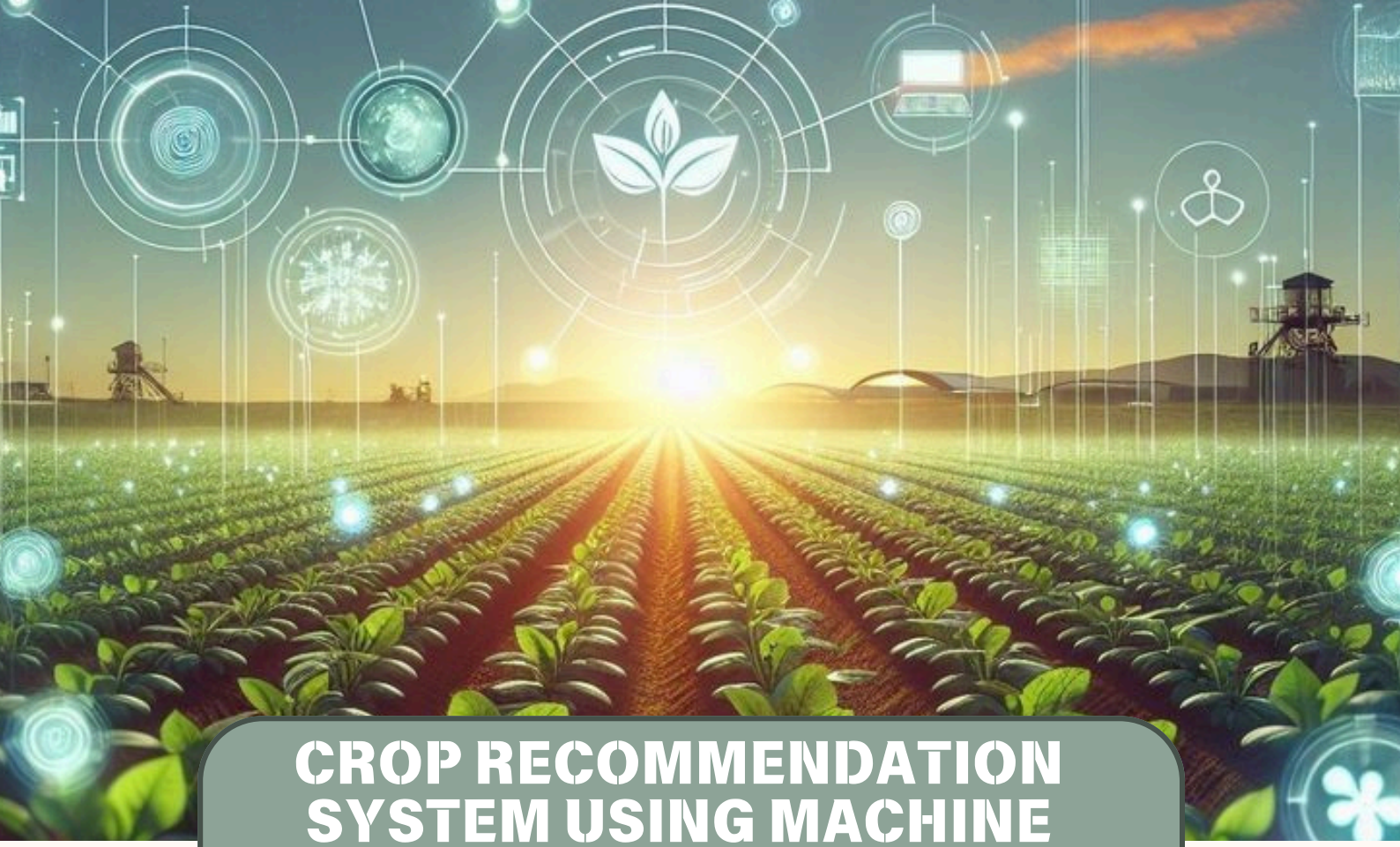


Figure: Privacy preservation

Silent Growth

"Every leaf on a tree tells a story , every lesson in life shapes who we become."

7727623BCS117 P C Ashwitha



CROP RECOMMENDATION SYSTEM USING MACHINE LEARNING WITH MARKET PRICE TRENDS

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ABSTRACT

A Crop Recommendation System utilizing machine learning is designed to help farmers choose the most suitable crops based on environmental data such as soil type, pH levels, temperature, rainfall, and market price history. By analysing this data through machine learning models like Random Forest and Decision Tree, the system predicts optimal crop choices for specific regions and seasons. In addition to environmental suitability, the system incorporates market price trends to enable farmers to maximize profitability by selecting crops with favourable price histories. It also helps prevent surplus harvesting of certain crops, such as vegetables, by using market analysis to avoid stockpiling and subsequent wastage or destruction due to overproduction. This approach improves agricultural productivity, resource efficiency, and supports sustainable farming practices.

INTRODUCTION

This Farming serves as a fundamental pillar of human society, supplying essential sustenance and materials for cultural advancement. Nevertheless, the industry grapples with various obstacles, including erratic climate patterns, soil erosion, and volatile market dynamics, which can negatively affect crop output and economic viability. Tackling these issues demands creative approaches that combine time-honored agricultural expertise with cuttingedge technological innovations The emergence of machine learning (ML) and data analytics has ushered in promising developments in agricultural decision support systems. These platforms can process vast amounts of environmental and economic information to guide farmers in making well-informed decisions.The Crop Recommendation System exemplifies such innovation, harnessing ML to deliver practical insights customized for specific regions and growing seasons.

This study introduces a comprehensive Crop Recommendation System designed to assist farmers in identifying ideal crops based on environmental variables like soil composition, acidity levels, temperature, and precipitation, along with market price patterns. The system employs ML algorithms such as Random Forest and Decision Tree to examine intricate datasets and generate accurate crop suggestions. By incorporating market analysis, the system ensures not only environmental suitability but also promotes financial sustainability by steering farmers toward crops with favorable price histories. Additionally, the system aims to alleviate problems like excess production and resource waste by forecasting market demand. Through this holistic approach, the proposed system contributes to boosting agricultural productivity, minimizing risks associated with crop failures, and encouraging sustainable farming methods. This paper delineates the system's methodology, implementation, and real-world applications, marking a significant stride in modernizing agriculture.

RELATED WORK

In recent years, the area of crop recommendation has experienced notable progress, with studies concentrating on machine learning techniques, analysis of environmental factors, and integration with market dynamics. This portion examines pertinent research in these areas and outlines the knowledge gaps that our proposed system aims to address.

Machine Learning For Crop Recommendation

Agricultural systems have extensively employed machine learning techniques to forecast appropriate crops based on environmental factors. Various algorithms, including Random Forest, Decision Trees, Support Vector Machines, and Naive Bayes, have shown their efficacy in examining complex agricultural datasets. For example, Random Forest is widely acknowledged for its ability to resist overfitting, while Decision Tree models are appreciated for their ease of interpretation, making them user-friendly for non-experts.

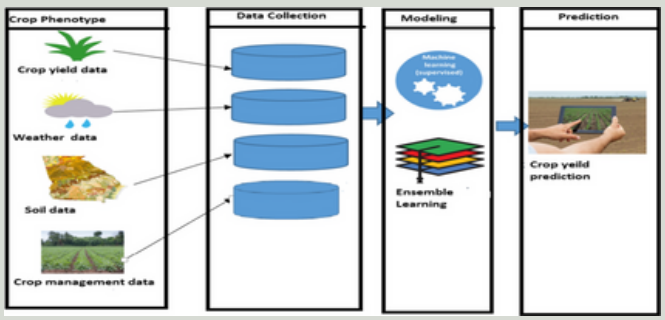


Figure: Architecture

Market Analysis and Economic Factors

The incorporation of market trends into agricultural decision-making systems remains a largely unexplored field. While certain research has highlighted the significance of analyzing past market price patterns and projecting demand to help farmers select lucrative crops, current models often rely on unchanging data, neglecting to consider fluctuating market conditions. This shortcoming prevents farmers from making optimal choices in real-time, potentially resulting in excess production or economic setbacks.

Gaps in Existing System

Despite notable advancements, current systems often function independently, concentrating on either environmental compatibility or economic aspects without merging the two. Furthermore, numerous solutions lack immediate insights and user-friendly interfaces, reducing their accessibility to farmers with limited resources. These shortcomings underscore the necessity for an all compassing system that integrates machine learning and market analysis to provide practical and comprehensive crop suggestions.

Evaluation Criteria

The effectiveness of crop recommendation systems is typically assessed through various criteria, including accuracy, precision, and usability. Models that analyze environmental data are evaluated primarily on their predictive accuracy in determining the most appropriate crops for specific soil and climatic conditions. Common performance metrics in this area include confusion matrices, F1 scores, and classification accuracy. Additionally, systems that incorporate market analysis are judged on their capacity to forecast profitable crop selections by taking into account price trends and market demand. User-focused evaluations, such as the simplicity of the interface and the actual adoption of the system by farmers, are also vital in gauging the success of a recommendation system. Numerous studies fall short of providing a comprehensive evaluation framework that combines both technical performance and practical usability, indicating potential areas for enhancement.

METHODOLOGY

The proposed Crop Recommendation System employs machine learning algorithms alongside market data analysis to forecast the optimal crops for particular regions and seasons. By integrating environmental parameters such as soil type, pH levels, temperature, and rainfall with historical and real-time market price trends, the system provides farmers with actionable insights for sustainable and profitable farming practices across various geographical areas. This section details the data sources, preprocessing procedures, machine learning models, and the overall workflow of the system, highlighting the synergy between technical analysis and practical field-level applicability.

Data Collection

The system relies on two primary types of data:

- Environmental Data: Includes parameters such as soil type, pH levels, temperature, rainfall, and seasonal patterns. This data is collected from publicly available datasets and agricultural research institutions.
- Market Data: Historical market price trends and demand data for various crops are gathered from government databases and agricultural commodity platforms.

Data Preprocessing

To ensure accurate and reliable predictions, the collected data undergoes the following preprocessing steps:

- Data Cleaning : Removal of incomplete, redundant, or irrelevant data entries.
- Feature Scaling: Standardization of numerical features such as pH levels and temperature to bring them to a common scale.
- Categorical Encoding: Conversion of categorical variables (e.g., soil type) into numerical representations for compatibility with machine learning models.

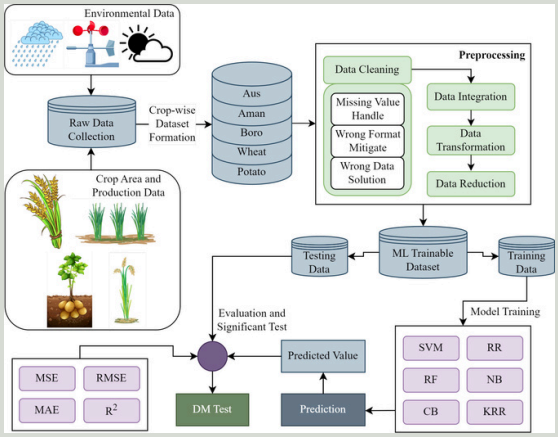


Figure: Recommendation System

Machine Learning Models

Two machine learning algorithms, Random Forest and Decision Tree, are employed to predict the optimal crops:

Random Forest: This ensemble learning model combines multiple decision trees to provide robust and accurate predictions. It is particularly effective in handling non-linear relationships and high-dimensional data.

Prediction = (Σ(Predictions from all decision trees)) / (Number of trees) , Aggregate the outputs from multiple decision trees for classification or regression.

Decision Tree: A tree-structured algorithm that uses a series of decision nodes to classify data points. It is selected for its simplicity and interpretability, allowing end-users to understand the decision-making process.

The models are trained on historical environmental and market data, with the target variable being the crop most suitable for the given conditions. Hyperparameter tuning is performed to optimize model performance.

Integration of Market Price Trends

Market price trends play a vital role in assisting farmers to make well-informed and financially beneficial decisions. The suggested system integrates real-time analysis of market data, which can be accessed via a dynamic webpage developed with Node.js, to improve the crop recommendation process.

Real Time Data Integration :

The system integrates real-time market price data from external APIs provided by government or agricultural platforms. These APIs deliver updated information on:

- Current and historical market prices for various crops.
- Regional demand and supply patterns.
- Seasonal price variations for crop categories.

Dynamic Webpage Development

A user-friendly, dynamic webpage is developed using Node.js to serve as the main interface for farmers. This webpage offers :

- Interactive input forms for entering environmental parameters such as region, soil type, and pH levels.
- Visual dashboards displaying crop recommendations with associated market price insights.
- Graphs and tables illustrating price trends and profitability metrics

Market Data Analysis

The system analyzes the fetched market data to identify profitable crops. Techniques like trend analysis and demand forecasting are employed to assess the economic viability of each crop. These insights are integrated with environmental suitability predictions to provide a balanced recommendation.

Integrated Recommendation System

The combination of market price trends with environmental suitability ensures that the system generates actionable recommendations. The final output is a ranked list of crops that considers:

- Compatibility with soil and climate conditions.
- Profitability based on current and historical market data.
- Seasonal demand and risk of market saturation.

Impact on Farmer Decision-Making

By incorporating market price trends, the system empowers farmers to :

- Avoid overproduction of less profitable crops.
- Focus on cultivating high-demand crops with favorable price trends.
- Make sustainable decisions that balance environmental and economic factors.

RESULTS AND DISCUSSION

The proposed Crop Recommendation System was tested on real-world datasets to evaluate its performance in predicting suitable crops and integrating market price trends. This section discusses the results of the machine learning models, the effectiveness of market trend analysis, and the usability of the developed system.

Machine Learning Model Performance

The machine learning models, namely Random Forest and Decision Tree, were assessed using conventional metrics including accuracy, precision, recall, and F1-score. The Random Forest model exhibited superior accuracy owing to its ensemble approach, which adeptly managed the variability present in the dataset. Although the Decision Tree model was marginally less accurate, it offered a level of interpretability that improves user comprehension of the underlying prediction mechanisms

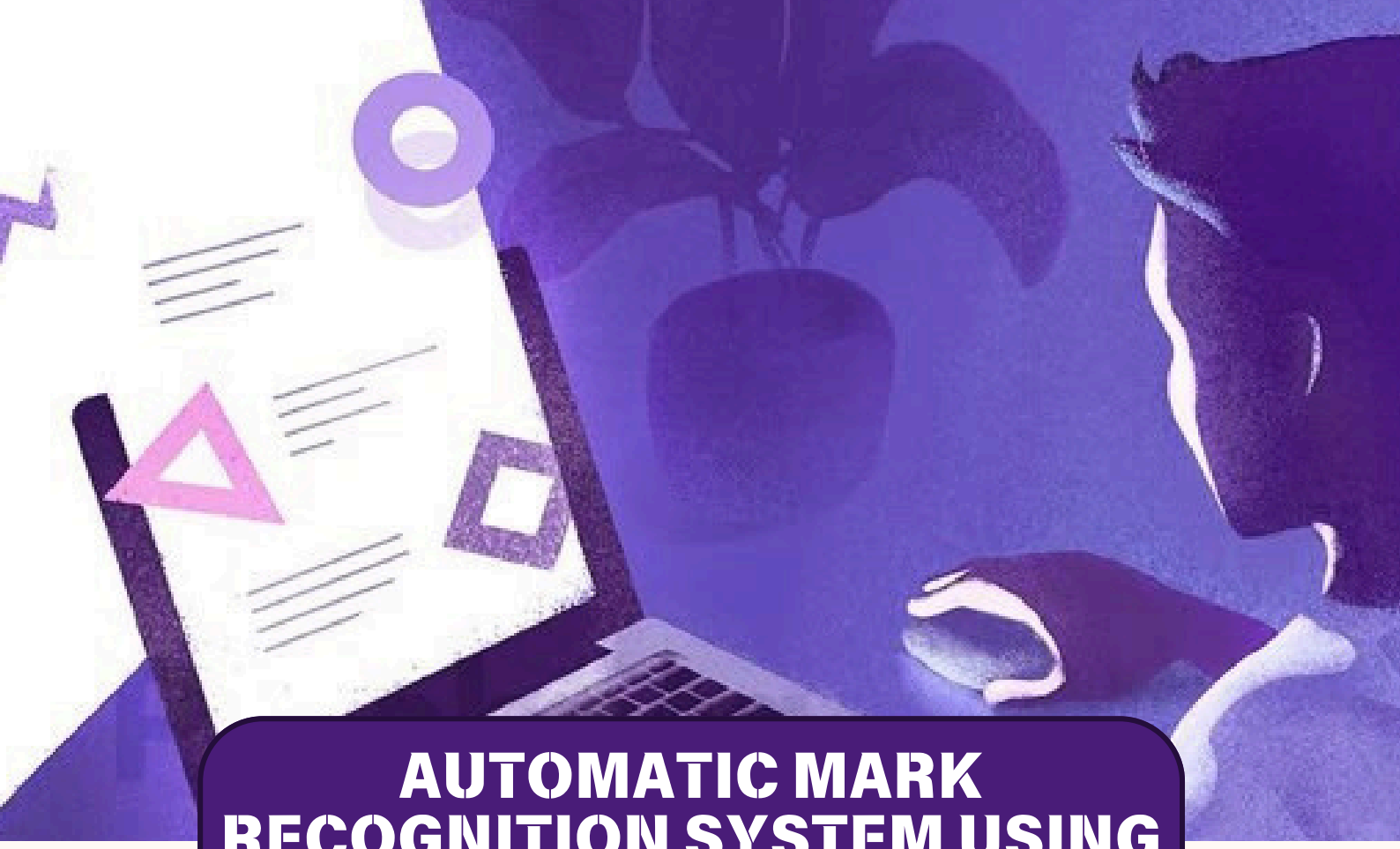
Integration of Market Price Trends

The incorporation of market price trends greatly improved the recommendations provided by the system. Real-time price information obtained through APIs offered valuable insights into economic feasibility, enabling farmers to focus on crops that yield greater profits. Additionally, seasonal fluctuations in prices and demand patterns were successfully integrated, ensuring that the recommendations are in harmony with market conditions.

User Interface and Webpage Usability

The dynamic webpage, built using Node.js, provided a seamless interface for users to input environmental parameters and view detailed crop recommendations. The inclusion of visual dashboards and trend analysis graphs improved user engagement and understanding.

The findings underscore the advantages of merging environmental suitability assessments with market analytics for crop recommendations. Although Random Forest achieved notable accuracy, the true value of the system is found in its capacity to harmonize technical forecasts with economic considerations.



AUTOMATIC MARK RECOGNITION SYSTEM USING MACHINE LEARNING

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ABSTRACT

The Automatic Mark Recognition System Using Machine Learning is a transformative educational technology project designed to streamline and enhance the grading process in academic institutions. This innovative system leverages machine learning algorithms to automate the traditionally manual and time-intensive task of mark entry. By eliminating human errors, ensuring consistency, and minimizing time constraints, the system aims to significantly improve efficiency in the grading work flow. The project also focuses on user accessibility, offering an intuitive interface for educators and administrators. The project's ultimate goal is to create a technologically advanced, userfriendly, and efficient solution that positively impacts educational institutions, providing more time for personalized student engagement and enhancing the overall learning experience.

The Automatic Mark Entry System, driven by innovative algorithms, stands as a beacon for efficiency, accuracy, and adaptability in the reality of academic assessment, promising a transformative impact on educational institutions.

OVERVIEW OF THE PROPOSED SYSTEM

The Automatic Mark Recognition System (AMRS) is an intelligent system capable of automating the assessment and mark entry procedure through machine learning and image processing. AMRS seeks to mitigate the inefficiency and inaccuracy of manual assessment by identifying and extracting marks on scanned or imaged answer papers— printed or handwritten. The system utilizes sophisticated machine learning models such as convolutional neural networks (CNNs) to recognize and interpret marked answers or scores, regardless of varying image conditions. After the marks are read, they are automatically digitized and sorted into structured formats like Excel sheets or databases.

AMRS offers teachers real-time feedback about student performance, facilitating unit wise analysis, grade calculation overall, and progress monitoring. By facilitating the automation of the mark recognition process, AMRS eliminates educator workload, minimizes human error, and enhances result processing speed. The system increases the precision, reliability, and scalability of academic assessment, enhancing institutions' ability to provide timely feedback and driving better learning outcomes.

The Automatic Mark Recognition System (AMRS) proposed here utilizes machine learning and image processing algorithms to mark sheets automatically from answer sheets. The algorithm begins by scanning or uploading scanned or photograph images of completed answer sheets. These can be multiple-choice answer sheets, numerical tests, or instructor- marked scores. During preprocessing, methods like grayscale conversion, noise removal, skew correction, and binarization are used to normalize the input images. After preprocessing, the system employs a trained machine learning model, usually a CNN, for region detection to determine the positions of marks or scores on the sheet. For handwritten numeric marks or checked boxes, character recognition models and image classifiers are utilized to read the content.

AMRS combines grid detection with intelligent segmentation in order to select the appropriate segments of the answer sheet. It then extracts detected marks and reads them into digital form. Techniques of post- processing, including validation of confidence score and error checking, guarantee result accuracy. The digitized marks are then collated into structured formats (Excel or database entries), and performance metrics are computed, including total scores, unit-wise analysis, and grading. Teachers are given an easy-to-use interface wherein they can inspect and, if necessary, modify extracted data before final submission.

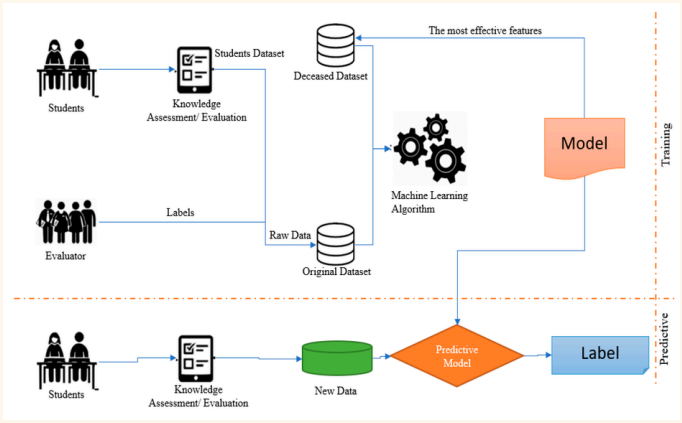
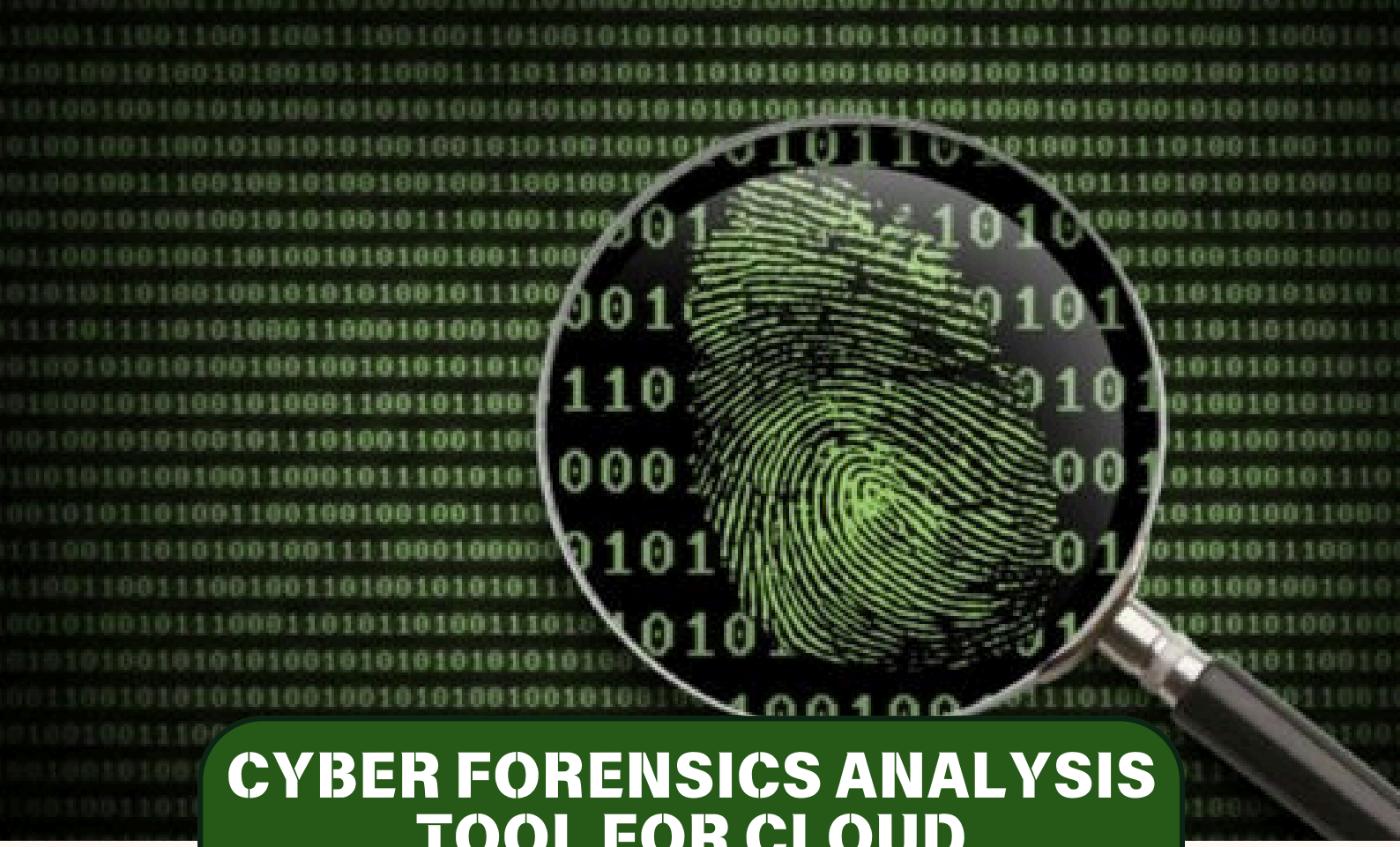


Figure: Architecture

CONCLUSION

The Automatic Mark Recognition System that has been built in this project utilizes the potential of machine learning and OCR to mechanize the otherwise manual and error- ridden task of academic mark inputting. With the fusion of strong OCR technologies such as Paddle OCR with structured mark templates and smart data processing, the system proves to be a highly effective and scalable solution for educational institutions. The proposed method successfully lifts and structures handwritten strokes from scan files into Excel tables with little or no human involvement. It accommodates both Part A (objective/short-answer) and Part B/C (descriptive/sub-part) type questions, automatically computes section-wise and overall marks, and reduces human error by enabling accurate detection and verification. The system has exhibited very high reliability in real test scenarios, achieving accuracy of over 92%, verifying its ability to generalize across a variety of handwriting styles and formats. Apart from automation, this project also demonstrates the potential of AI-driven systems in simplifying administrative burdens, lessening manual efforts, and increasing transparency in managing academic records. The outcomes reiterate the applicability of the integration of computer vision and machine learning in automating and augmenting traditional evaluation processes.



CYBER FORENSICS ANALYSIS TOOL FOR CLOUD ENVIRONMENTS

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Haripriya C- 727621BCS045
Mohammad Faisal J- 727621BCS009

ABSTRACT

The Cyber Forensics Analysis Tool for Cloud Environments" is an end-to-end solution intended to automate the process of collecting, analyzing, and preserving cloud-based digital evidence, with particular emphasis on AWS services. It is integrated into AWS to pull data from EC2 instances, S3 buckets, IAM roles, CloudTrail logs, and Lambda functions. It conducts advanced analysis on the gathered data to produce actionable findings and generates extensive reports. The tool has an easy-to-use interface developed on the web, allowing users to enter credentials, handle data collection, and trigger analysis easily. The tool also has secure encryption methods for data storage and automatic report generation with visualizations. The project includes comprehensive database interactions and gives unit tests to make it reliable. It gives a cost effective solution for Cybersecurity experts requiring to analyze and handle cloud-based forensic data methodically.

INTRODUCTION

A Cyber Forensics Analysis Tool is used to help cybersecurity professionals systematically examine and preserve digital evidence to identify malicious activity. Such tools offer an integrated set of forensic analysis capabilities such as data recovery, file system analysis, network traffic analysis, and the detection of cyberattack indicators like malware and unauthorized access. In addition to cybersecurity measures, such tools assist security professionals in investigating the consequences of a breach, identifying the origin of attacks, and assisting with incident response activities. threat landscape changes, these tools are continually updated to counter new attack vectors such as ransomware, phishing, and insider threats. In general, incorporating an enterprise-class Cyber Forensics Analysis Tool into an organization's cybersecurity system improves the capacity for incident response and recovery, providing more effective defense against future threats.

CYBER FORENSICS

Cyber Forensics is computer forensics, it is an important discipline that deals with locating, gathering, examining, and maintaining digital evidence to investigate security breaches and cybercrimes. It has numerous subdomains such as computer forensics, network forensics, mobile forensics, cloud forensics, malware forensics, and IoT forensics, which deal with various aspects of computer investigations. The cyber forensic procedure adheres to systematic steps like identification, collection, preservation, analysis, documentation, and reporting, so digital evidence is not rendered inadmissible. Professionals employ advanced tools such as forensic imaging software, data recovery tools, network sniffers, and malware analysis systems to identify cyber threats and track attackers. Cyber forensics is crucial in identifying cybercrimes, minimizing security threats, aiding legal processes, and improving the cybersecurity of individuals, enterprises, and law enforcement. Despite these, challenges like encryption, changing technology, jurisdictional difficulties in cloud forensics, and anti-forensic practices by cybercriminals still complicate investigations. In spite of these challenges, cyber forensics is still an integral part of contemporary cybersecurity, assisting organizations and authorities in addressing cyber threats and promoting digital security.

METHODOLOGY

The proposed methodology in the present cyber forensics project adopts a systematic process incorporating data gathering, analysis, visualization, and reporting to pinpoint security anomalies in cloud environments. The tool is implemented with Python and utilizes AWS SDK (Boto3) to retrieve logs and metadata from EC2 instances, S3 buckets, IAM roles, CloudTrail logs, and Lambda functions.

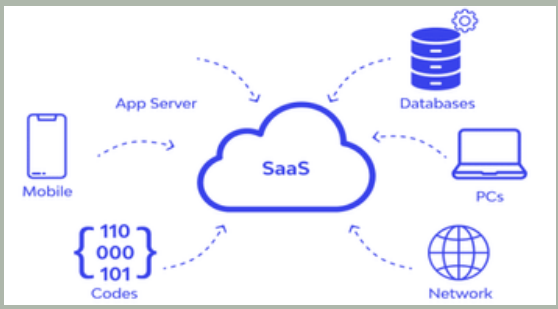

Figure: Cloud forensics

The forensic process starts with extracting key information from such AWS services as EC2 instance information, security group settings, launch times, S3 object metadata, IAM permissions, CloudTrail events, and Lambda function settings. The data so extracted is analyzed for potential security threats like unauthorized access, misconfigurations, excessive permissions, suspicious file uploads, and malicious behavior.

In the analysis stage, pre-defined forensic rules are used to identify anomalies like open security groups, instances started at odd times, public IP addresses exposed, and IAM roles with high privileges. S3 bucket contents are also scanned for malicious file types, embedded credentials, and unauthorized changes. The tool also analyzes CloudTrail logs to detect high-risk threats like privilege escalation events, failed login attempts, and bulk deletions. The data is then visualized with Matplotlib to produce bar charts and pie charts showing the count of anomalies by AWS service, which enables security teams to quickly comprehend threat distributions.

The last step is creating organized forensic reports with FPDF. These include a detailed analysis of security findings, such as metadata, identified threats, and suggested mitigation strategies. Combining automatic data extraction, threat identification, visualization, and reporting guarantees AWS security investigations are efficient and streamlined. The process not only advances forensic analysis but also offers security teams actionable intelligence to counter risks in cloud environments.

EXISTING SYSTEM

The existing system of cloud forensics adopts a systematic process of collecting, analyzing, and maintaining digital evidence from cloud environments, which are being targeted more and more in cyber attacks. With organizations depending on cloud storage and services, the demand for forensic investigation techniques that can recover and analyze cloud based data effectively has increased. The process starts with the retrieval of cloud data via authentication processes offered by Cloud Service Providers (CSPs), such that the process of retrieval is in line with security and compliance requirements.

This authentication is made possible by APIs that provide controlled access to the digital evidence stored. For obtaining cloud data, the Rclone tool is utilized, a popular open-source command-line tool that allows synchronization, copying, and mounting of cloud storage data onto forensic workstations. A configuration file is employed to control credentials and access settings for efficient and secure data transfer. Upon successful retrieval of the data, forensic examiners conduct memory analysis to pull essential artifacts like system logs, metadata, access histories, and footprints of malicious activities. All these findings aid in reconstructing attack patterns, determining security breaches, and the scope of compromise.The last phase of the existing system is report generation, where the comprehensive forensic report is prepared, recording all discoveries, investigative techniques, and legal concerns. The report is of prime importance in legal cases, cybersecurity audits, and compliance reviews. Although the current system offers an organized framework of performing cloud forensic investigations, the system is still plagued by various challenges such as dependency on CSP policies, dynamic cloud storagecaused data volatility, complexities with manual configuration settings, and shortcomings in real-time forensic capabilities. These shortcomings confirm the necessity to increase automation levels, strengthen security controls, and streamline forensic operations to make them efficient, scalable, and forensically valid cloud investigations.

PROPOSED SYSTEM

The proposed system is an end-to-end AWS cyber forensics tool that is meant to examine security threats in various AWS services such as EC2, S3, IAM, CloudTrail, and Lambda. The tool is built with Python and uses AWS SDK (Boto3) to gather, process, and examine cloud-based digital evidence.

The system is designed to automate forensic investigations by extracting logs and metadata, identifying anomalies, and creating detailed reports. The system starts by gathering vital forensic information from AWS services. For EC2, it retrieves instance information including state, IP addresses, security groups, launch times, and attached volumes. It proceeds to examine these parameters for identifying such anomalies as unapproved instance launches, open security groups, and public IP addresses exposed. For S3, it reads bucket data, scans files for malicious activity, and detects potential data breaches by scanning file types, embedded URLs, and credential leaks. IAM module checks user roles and permissions to find abusive privileges or unauthorized role changes that can become security threats. Moreover, CloudTrail logs are checked to detect high-risk threats like privilege escalation events, failed login attempts, and bulk deletions. The Lambda module checks function settings, memory assignment, timeout configuration, and environment variables to look for possible misconfigurations and security threats.

After data gathering and analysis, the system processes predefined forensic rules to mark abnormalities, such as security misconfigurations and malicious behavior. Results are represented in Matplotlib with bar charts and pie charts identifying security threats pertaining to each AWS service. These visualizations enable security teams to rapidly determine vulnerabilities and set remediation priorities. The last step is producing formatted forensic reports with FPDF, consolidating identified threats as well as corresponding mitigation suggestions. Through the automated retrieval, analysis, visualization, and reporting of data, the suggested system maximizes AWS security investigations, yielding security teams meaningful insights to forestall risks and maintain compliance within cloud environments.

MODULE DESCRIPTION

EC2 MODULE

The EC2 Module gathers and examines metadata for AWS EC2 instances. It retrieves instance information like state, IP address, security groups, launch times, and attached volumes.

The module detects anomalies associated with unusual launch times, publicly exposed IP addresses, overly open security groups, and suspicious data in attached volumes. The analysis results are shown in the web-based UI so that investigators can examine forensic results. The module also assists in forensic reporting by aggregating metadata and security threats into formatted reports for further analysis.

S3 MODULE

The S3 Module scans AWS S3 buckets to identify unauthorized access, malicious uploads of files, possible credential disclosure, and unwarranted changes to sensitive information. It downloads and scans files for suspicious signatures, such as malicious scripts, embedded URLs, and custom-defined threat indicators. The results are displayed in the Flask web UI, allowing security teams to monitor anomalies efficiently. The results are also retained for forensic reporting so that possible threats are recorded for further analysis.

IAM ROLE MODULE

IAM Role Module scans AWS Identity and Access Management (IAM) roles and policies to detect security threats like grantee permissions, unused roles, and inline policies with wildcard permissions. It fetches role information, attached policies, and last used timestamps to scan for anomalies like highly privileged roles or unused roles. The module classifies risk into high, medium, and low levels with a clear visual representation of IAM security posture. The results are incorporated into the forensic report so that security teams can prioritize remediation.

CLOUDTRAIL MODULE

The CloudTrail Module examines AWS CloudTrail logs to identify suspicious activity like privilege escalation events, failed logins, and bulk deletions. It processes event logs to detect unusual IP activity, unauthorized API calls, and possible security breaches. The module classifies events into suspicious actions, failed logins, and bulk deletions, giving a detailed breakdown of security incidents. The findings are represented in bar charts, making it simpler for security teams to comprehend and act on threats.

AWS LAMBDA FUNCTION MODULE

The AWS Lambda Function Module analyzes Lambda function configurations to check for security vulnerabilities like high memory allocation, long timeout executions, and sensitive data in environment variables. It fetches function information, including runtime, memory size, timeout values, event sources, and environment variables. The module alerts possible misconfigurations and security vulnerabilities like S3 or SNS event-triggered functions and functions containing sensitive environment variables. The results are incorporated into the forensic report, assisting teams in securing their serverless applications.

REPORT AND VISUALIZATION MODULE

The Reporting and Visualization Module outputs structured forensic reports with FPDF and offers graph representations of security threats through the use of Matplotlib. The module summarizes outcomes from EC2, S3, IAM, CloudTrail, and Lambda to produce comprehensive reports that capture metadata, identified anomalies, and prescribed mitigation methods. The Flask-based UI enables viewing trends in graph form via interactive charts and downloadable reports for processing further analysis. The module produces well documented forensic investigations as it gives measurable insights for use by security personnel

.FLASK WEB INTERFACE

Flask web interface acts as the GUI for the Cyber Forensics Analysis Tool to present a human-friendly interface with which users may interact with tool functionalities. Flask-based, this interface enables user input of AWS credentials, designation of services on which to run analysis, and forensic result inspection. It offers integration with backend modules to enable the presentation of analysis outputs in the form of suspicious instances, high-risk IAM roles, and CloudTrail events. The interface also accommodates the creation and downloading of forensic reports in PDF format, which makes it a complete solution for cloud forensic investigations.

LITERATURE SURVEY

The literature survey explores various forensic frameworks and methodologies designed to address challenges in cloud environments, emphasizing issues such as data volatility, encryption barriers, jurisdictional complexities, and lack of direct access to cloud infrastructure. Several studies propose specialized forensic frameworks to overcome these limitations. A forensic investigation framework for decentralized storage integrates cryptographic integrity verification and blockchain transaction logs for evidence tracking, while a cloud-based forensic analysis system leverages cloud computing platforms to detect cyber threats such as phishing, botnets, and DDoS attacks. The forensic analysis of Rclone highlights forensic artifacts generated by cloud storage tools, emphasizing their role in investigations. Secure forensic storage models incorporate encryption, two-factor authentication, and integrity checks to protect digital evidence.

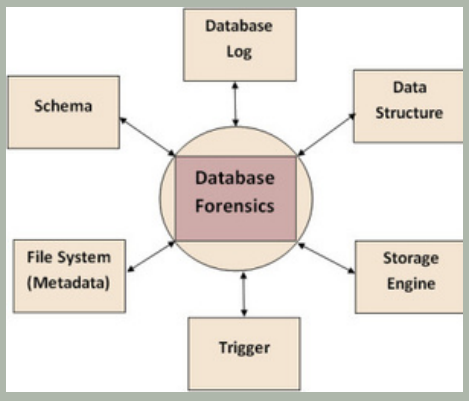

Figure: Forensic database

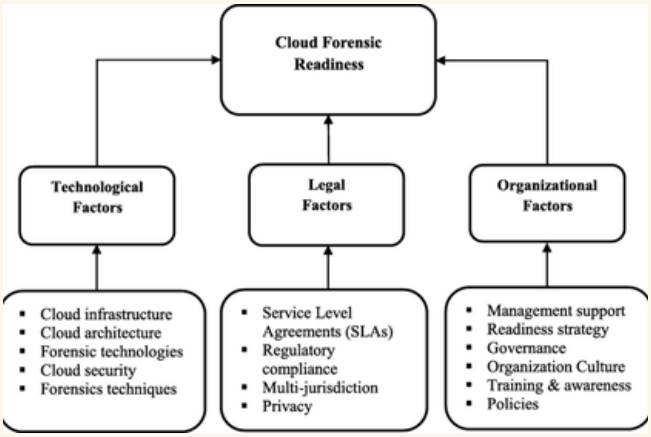

Figure: Readiness framework

Additionally, automated forensic data acquisition methods use hypervisor-based monitoring, snapshots, and forensic logging to ensure real-time data collection while preserving the chain of custody. Studies on forensic techniques for emerging technologies, such as IoT and Cyber-Physical Cloud Systems, stress the need for adaptive forensic strategies. A meta-analysis of cloud forensic frameworks identifies a lack of standardization, urging the development of legally admissible forensic methods. Lastly, cloud-based forensic tools provide scalable and efficient solutions for remote investigations, reducing reliance on physical infrastructure while enhancing cybersecurity enforcement.

RESULT

The result of the project is an in-depth forensic analysis report created for the chosen AWS services, which are EC2, S3, IAM, CloudTrail, and Lambda. The application detects security abnormalities like public IP addresses exposed, overly liberal security groups, untrusted file uploads, excessive IAM permissions, and atypical CloudTrail events. The findings are given in textual and graphical formats, with bar charts and pie charts showing the breakdown of security threats by service.

For EC2, the tool identifies instances launched outside of regular hours, exposed public IP addresses, and suspiciously attached volumes. For S3, it identifies malicious file types, embedded credentials, and unauthorized changes. The IAM module identifies roles with excessive permissions and unused roles, and the CloudTrail module detects suspicious activity, failed logins, and bulk deletions. The Lambda module identifies misconfigurations like high memory usage, long timeouts, and sensitive environment variables.The output gives cybersecurity professionals actionable recommendations to counter risks and improve the security of their cloud infrastructure.

INTELLIGENT JOB FINDER AND RESUME BUILDER

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ABSTRACT

In the dynamic and competitive landscape of job seeking, individuals often face challenges in identifying and applying for roles that truly match their skills and aspirations. This project, titled "Job Fit: Personalized Resume Builder and Opportunity Finder," addresses these challenges through an interactive web-based application designed to enhance the job application process. The application leverages sophisticated filtration algorithms to analyze user profiles and preferences, effectively filtering and recommending job roles that align with their qualifications. By utilizing advanced data analysis techniques, the system ensures that users receive tailored job suggestions that maximize their chances of success. Additionally, "Job Fit" features an intuitive resume-building tool that automatically customizes resumes based on specific job descriptions, allowing users to present themselves more effectively to potential employers.

By emphasizing a user-centered design, this project not only streamlines the job search experience but also highlights the transformative power of technology in creating employment solutions.

OVERVIEW OF THE PROPOSED SYSTEM

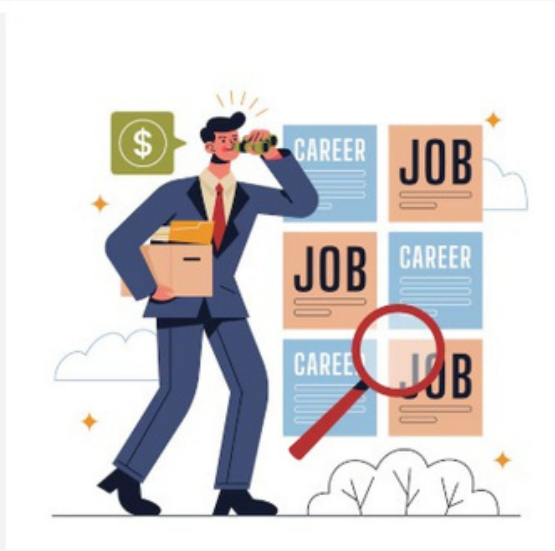
The proposed system, Intelligent Job Finder and Resume Builder, enhances traditional job search platforms by integrating TF-IDF and cosine similarity algorithms to intelligently match resumes with relevant job postings. Unlike basic keyword-based systems, it uses Natural Language Processing (NLP) to extract skills and context from both resumes and job descriptions, enabling more accurate and personalized recommendations. The resume builder component also provides real-time suggestions, highlights missing skills, and optimizes content for ATS (Applicant Tracking Systems), making resumes more competitive.

By analyzing job market trends and understanding semantic relationships between terms, the system bridges the gap between what candidates offer and what employers seek, ensuring better job fit and higher success rates.

PROPOSED SYSTEM ALGORITHM & METHODOLOGY

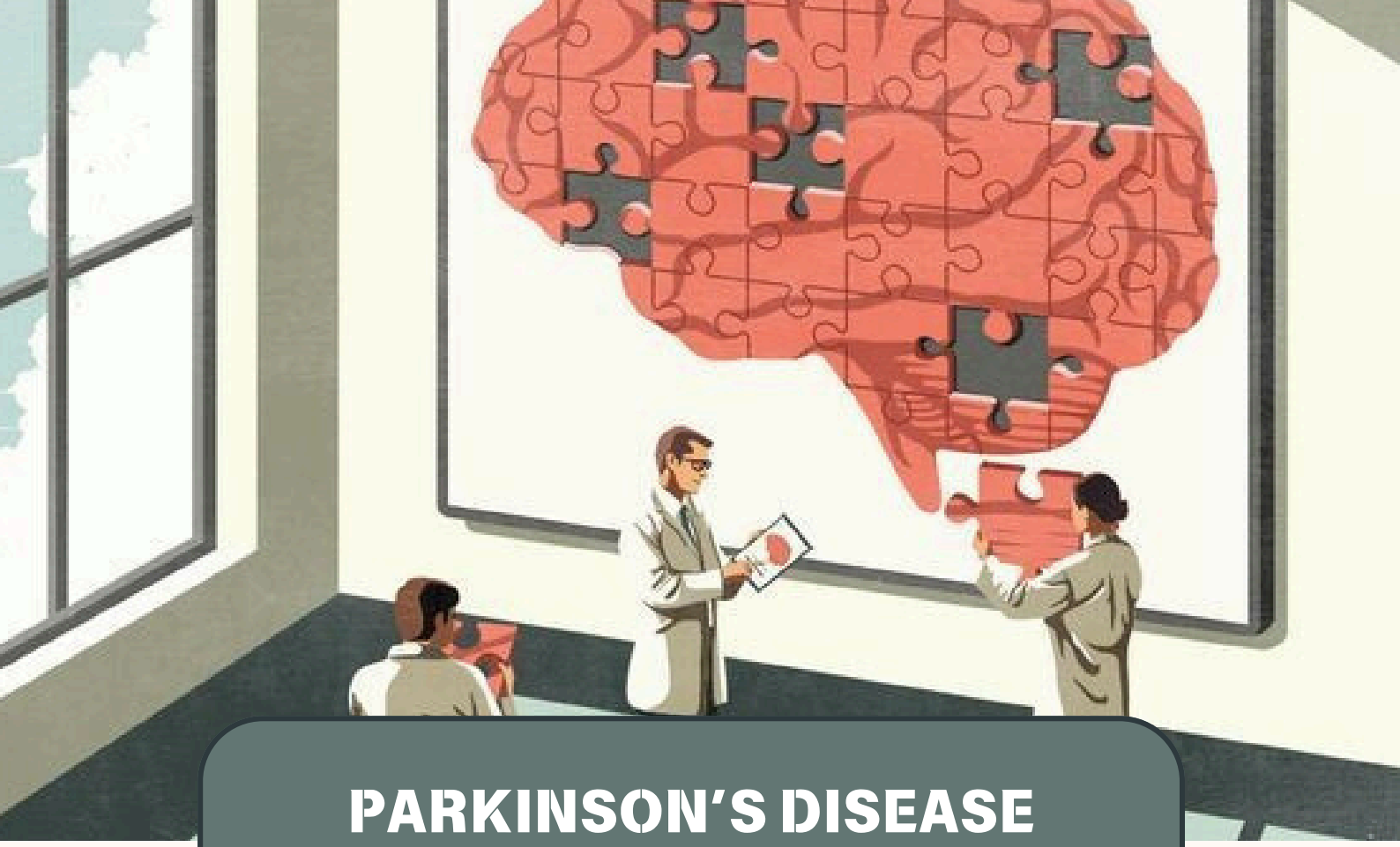
The proposed system is designed to intelligently match job seekers with relevant job opportunities and assist in creating optimized resumes. The core of the system uses the TF-IDF (Term Frequency–Inverse Document Frequency) algorithm to analyze and rank the relevance of job descriptions and resumes. By processing natural language content in both resumes and job postings, the system identifies key skills and requirements, ensuring more accurate matching between candidate profiles and job roles. This enhances both the job search experience and the quality of resumes generated or refined. The resume builder takes user-inputted data such as work experience, education, skills, and career objectives, and structures this information into a professional format. It uses TF-IDF to identify and highlight the most impactful keywords based on job market trends and job description data. This enables the system to recommend modifications to the user's resume, ensuring it contains relevant terminology that increases visibility in applicant tracking systems (ATS). The system may also suggest personalized resume templates and section arrangements based on the target industry. The job finder component collects and indexes job listings from various sources such as company websites or job boards.

Using TF-IDF, it evaluates each job posting's content and compares it to the user's resume or profile data. The algorithm computes the cosine similarity score between the job description and the resume to rank job matches by relevance. Additional filters such as location, job type, and salary preferences can further refine results. This ensures users receive job recommendations that align closely with their skills and experience.The entire system is integrated into a seamless user interface where job seekers can build resumes, upload existing ones, or directly search for jobs. Upon upload or resume creation, the system parses and tokenizes the text, computes TF-IDF scores, and maintains a vectorized representation of user profiles and job listings. Matching is executed in real-time using similarity scoring algorithms, and users receive both resume enhancement tips and job suggestions. Regular updates to the job database and keyword model keep the system aligned with market demands.



CONCLUSION

The Intelligent Job Finder & Resume Builder system is designed to bridge the gap between job seekers and recruiters by leveraging the power of NLP. It uses the TF-IDF algorithm to convert textual content from resumes and job descriptions into numerical features, enabling efficient comparison and relevance scoring. This allows the system to understand the importance of specific skills and keywords in the context of job requirements, resulting in more accurate and personalized job recommendations. The framework begins with data collection, where resumes and job descriptions are gathered from users and job portals. The collected data undergoes text preprocessing, including steps like tokenization, stop-word removal, and lemmatization to clean and normalize the text. Then, the TF-IDF algorithm transforms this processed text into numerical vectors, capturing the significance of words relative to the entire dataset. These vectors are crucial for the model to evaluate and match profiles to jobs effectively. To generate job recommendations and resume improvements, the system uses either similarity scoring (e.g., cosine similarity) or supervised machine learning models trained on labeled datasets. The resume builder feature assists users in creating tailored resumes by highlighting key skills and improving language based on job-specific requirements. As the model continues to learn and adapt, it becomes better at predicting relevant matches, offering both intelligent suggestions and high-accuracy job recommendations validated with model accuracy exceeding 85%.In conclusion, the Intelligent Job Finder & Resume Builder proves to be a powerful tool in today's competitive job market. By combining machine learning, text analytics, and user-friendly interfaces, it not only improves the quality of job matches but also empowers candidates to enhance their resumes for better visibility. The use of TF-IDF ensures that the system remains fast, scalable, and accurate in handling large volumes of textual data.



PARKINSON'S DISEASE DETECTOR

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ABSTRACT

The "Parkinson's Disease Detection Web Application" represents a groundbreaking and highly innovative tool poised to revolutionize the early detection of Parkinson's disease. The application employs spiral images as the primary input for its diagnostic process and has been meticulously designed to offer a user-friendly and intuitive experience. Users can seamlessly upload their spiral images, initiating a process that leverages advanced machine learning techniques and cutting-edge image processing algorithms. At the heart of this exceptional application is a state-of-the-art machine learning model, meticulously trained on an extensive and diverse dataset of spiral images. This rigorous training equips the model with the capability to accurately discern intricate patterns and distinctive features associated with Parkinson's disease. The result is a clear and immediate output, providing a precise assessment of the likelihood of Parkinson's disease based on the provided spiral image.

The streamlined process, encompassing image upload and result presentation, underscores the remarkable synergy of machine learning and image analysis within the healthcare sector that improves patient outcomes also contributes to a brighter future for individuals affected by Parkinson's disease. The significance of this application extends beyond the confines of diagnostics. It represents a pioneering leap in medical technology, offering a glimpse into a future where artificial intelligence and image analysis are pivotal in transforming healthcare. The fusion of machine learning and image processing has the potential to unlock new avenues for early detection and intervention across a spectrum of medical conditions.

OVERVIEW OF THE PROPOSED SYSTEM

The proposed system aims to detect Parkinson's disease using a machine learning approach, encompassing all stages from data preparation to deployment.

The process is as follows:

Data Preparation

The system begins by collecting and preprocessing data related to Parkinson's disease, that includes medical records, vocal recordings, and other relevant biomarkers. Preprocessing steps involve cleaning the data, handling missing values, normalizing features, and ensuring the dataset is ready for analysis.

Model Definition

A suitable machine learning model is selected based on the nature of the data. Algorithms like Support Vector Machines (SVM), Random Forest, or neural networks are defined to classify whether a patient is likely to have Parkinson's disease or not.

Model Training

The selected model is trained on the prepared dataset. Training involves optimizing parameters to ensure the model effectively learns patterns indicative of Parkinson's disease.

Model Evaluation

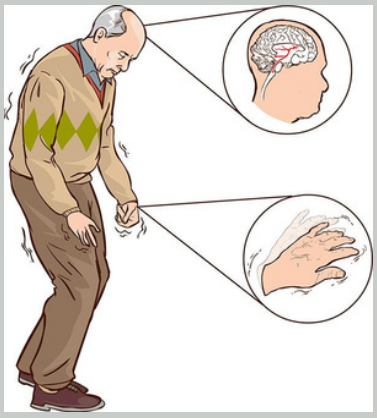
The trained model is evaluated using metrics such as accuracy, precision, recall, and F1- score. Validation is performed on unseen data to test the model's robustness.

Visualization and Performance Metrics

The performance of the model is visualized through graphs and metrics and this helps stakeholders interpret the results and assess the model's effectiveness.

Deployment and Prediction

Once the model demonstrates satisfactory performance, it is deployed in a user-friendly system or application. The deployed system can predict Parkinson's disease in new patients using their input data, providing real-time diagnostic assistance. By following this structured process, the system ensures reliable and accurate predictions, aiding in the early detection of Parkinson's disease and supporting medical professionals in their diagnostic processes.



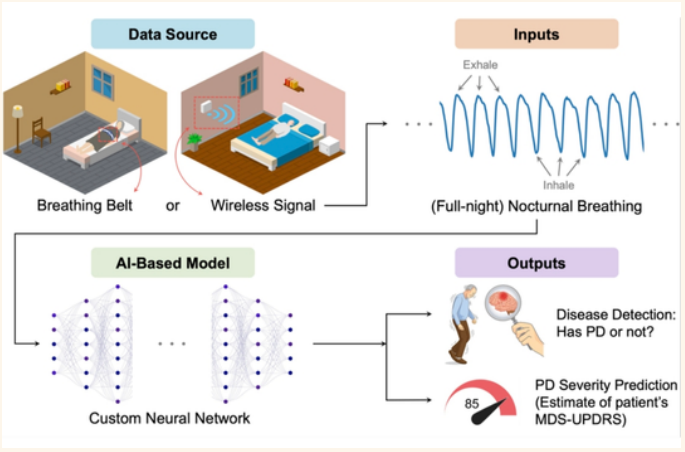


Figure: Working Architecture

CONCLUSION

The "Parkinson's Disease Detection System" represents a groundbreaking stride in the realm of medical diagnostics, particularly targeting the early detection of Parkinson's disease through automated analysis of spiral drawings. By leveraging the power of machine learning, we have designed a Convolutional Neural Network (CNN) model that excels in distinguishing individuals as either healthy or affected by Parkinson's disease based on their spiral drawing patterns. Our well-constructed model architecture, coupled with a comprehensive dataset, has yielded remarkable accuracy and sensitivity in detecting early signs of Parkinson's disease. The CNN's remarkable ability to autonomously discern intricate image features underscores the potential of data-driven approaches in disease detection. While the achievements of this project are notable, it is essential to recognize and acknowledge its inherent limitations. It should function as a diagnostic aid, assisting clinicians in their assessments and decision- making processes, ultimately improving the quality of care provided to patients.


WORD PLAY

1. What is the name for the act of protecting systems from digital attacks?

👉 **uyrSetic**

2. What term is used for the visible part of software that users interact with?

👉 **tneafcrei**

3. What word refers to how quickly a system responds to input?

👉 **clyeant**

4. What is the process of finding and fixing errors in code?

👉 **nbggeduig**

5. What is the term for a copy of data kept in case of failure?

👉 **kpbcau**

6. What word is used when data is arranged in a specific order?

👉 **dtreos**

7. What do we call the ability of a system to grow or expand?

👉 **iyltsbclaa**

8.What is the general word for tasks done at the same time?

👉 **lraellap**

9.What word describes a system's ability to continue after failure?

👉 **yvercore**

10. What term refers to information that describes other data?

👉 **admaette**

11. What word is used for the process of changing data into a coded form?

👉 **odcnnige**

12. What is the word for making something work better?

👉 **iotzaniotpim**

13. What is the term for a set of rules that defines how data is transmitted over a network?

👉 **crootlop**

14.What is the term for a software application that interprets and executes code line by line?

👉 **terterperin**

15.What term refers to a method of protecting data by encoding it into a different format?

👉 **oicnnyterp**

BIT DECODE

1.01010000 01111001 01110100 01101000 01101111 01101110

2.01110100 01100101 01111000 01110100 01110101 01110000 01101111 01110010

3. 01110000 01110010 01101111 01100111 01110010 01100001 01101101

4.01110011 01100101 01110010 01110110 01100101 01110010

5.01101101 01101001 01101110 01101001 01101110 01100111

6. 01100001 01101100 01100111 01101111 01110010 01101001 01110100 01101001 01101101

7.01101110 01100101 01110111 01110100 01110101 01110010 01100101

8.01101001 01101110 01110100 01100101 01110010 01101110 01100101 01110100

9.01100011 01101111 01101101 01110000 01110101 01110100 01100101 01110010

10.01000011 01101111 01101101 01110000 01110101 01110100 01100101 01110010

THE ART CORNER

“Life is art, live yours in color ”

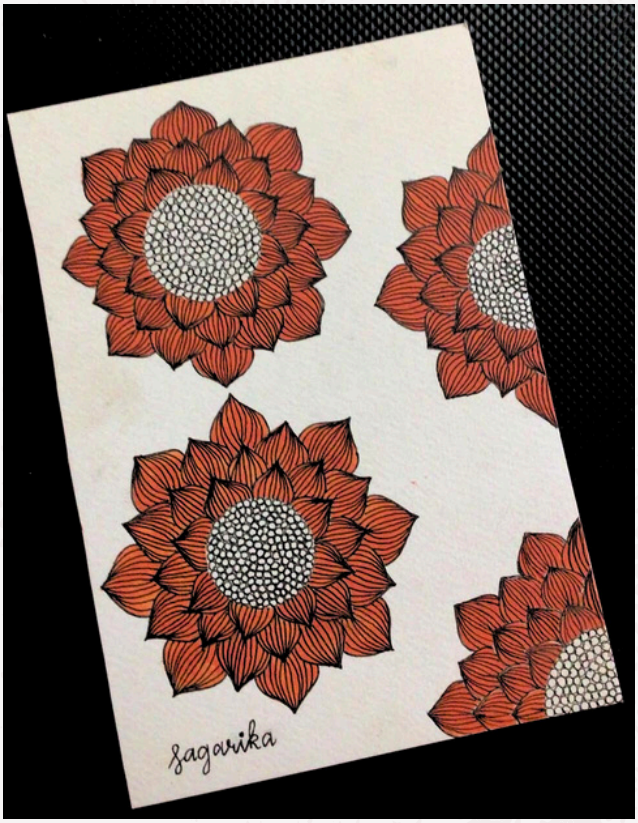
727623BCS161 - S Samyuktha

"Rise quietly, work relentlessly, succeed loudly."

727623BCS086 - R Shreya

"She blooms with grace, even when the world can’t see her roots."

727622BCS063 - N Pragadeesh



"Balance blooms from within."
727623BCS005 - S Shri Sagarika

"Calmness, clarity, and dedication , these are the tools of true knowledge."

7727623BCS117
P C Ashwitha

ANSWER KEY

CIPHER QUEST

Security → uyrSetic
Interface → tneafcrei
Interface → rnetcfiae
Latency → clyeant
Debugging → nbggeduig
Backup → kpbcau
Sorted → dtreos
Scalability → iyltsbclaa
Parallel → lraellap
Recovery → yvercore
Metadata → admaette
Encoding → odcnnige
Optimization → iotzaniotpim
Protocol → crootlop
Interpreter → terterperin
Encryption → oicnnyterp

BIT DECODE

Python
Processor
Program
Server
Mining
Algorthim
Network
Internet
Computer
Compiler

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