International Journal of
AI Electronics and Nexus Energy
Peer Reviewed, Referred & Indexed Journal
ISSN: 3070-0515 www.zesterapublications.com Original Research Paper

Smart Attendance Auto-Marker

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ABSTRACT

The Smart Attendance Auto Marker s an intelligent attendance management system developed to automate the traditional attendance process using modern technologies such as facial recognition and real-time data processing. The project aims to reduce manual work, eliminate proxy attendance, and improve accuracy in educational institutions and organizations. This project is developed using the AI, MERN stack (MongoDB, Express.js, React/Next.js, Node.js) and implements secure authentication using JSON Web Tokens (JWTThe Smart Attendance Auto Marker project can be used in schools, colleges, offices, coaching centers, hospitals, training institutes, and other organizations where attendance management is required. It automatically records attendance using facial recognition technology, reducing manual effort and saving time. In educational institutions, it helps teachers manage student attendance efficiently, while in offices and companies it can track employee presence and working hours accurately The system supports advanced features such as searching, filtering, sorting, and pagination for efficient data handling. Additionally, an asset history tracking module records all operations performed on assets, ensuring transparency and accountability. Attendance management is an essential part of schools, colleges, offices, and organizations. Traditional attendance systems, which rely on manual registers or ID verification, are time-consuming, less accurate, and can easily lead to proxy attendance or data loss. To overcome these problems, the Smart Attendance Auto Marker project is developed using modern technologies such as facial recognition, artificial intelligence, and real-time database management. The main purpose of this project is to automate the attendance process by identifying individuals through a camera and marking their attendance automatically. The system captures facial images, compares them with stored data, and records attendance with date and time information. This reduces human effort, improves accuracy, and saves valuable timeThe core functionality of the system includes CRUD (Create, Read, Update, Delete) operations for assets, user authentication, role-based authorization, asset assignment, and tracking of asset history. Admins have full control over the system, including managing users and assets, while Managers can handle asset allocation and updates. Employees have limited access, mainly to view assigned assets. Additionally, features like search, filtering, sorting, and pagination enhance usability, making it easier to manage large volumes of asset data efficiently.

Received: 20-04-2026 | Accepted: 29-05-2026 | Published: 04-06-2026

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OBJECTIVES OF THE PROJECT

The principal objectives of the proposed system are:

1. To automate the attendance marking process using facial recognition technology.
2. To reduce manual effort and save time in attendance management.
3. To prevent proxy or fake attendance and improve accuracy.
4. To maintain secure and digital attendance records with date and time details.
5. To provide a user-friendly system for teachers, employees, and administrators.
6. To generate attendance reports quickly and efficiently.
7. To improve transparency and reliability in attendance tracking.
8. **To** develop a smart and modern attendance management solution for educational institutions and organizations

LITERATURE SURVEY

The main objective of the **Smart Attendance Auto Marker** project is to automate the attendance process using facial recognition technology and real-time data management. The system is designed to reduce manual effort, save time, and improve the accuracy of attendance records. It helps prevent proxy attendance by identifying individuals through their facial features and automatically storing attendance details with date and time information. The project also aims to provide a secure, user-friendly, and efficient digital attendance system that can generate reports easily for schools, colleges, offices, and other organizations. Overall, the project focuses on creating a smart, reliable, and modern solution for attendance management. efficiency. Patel et al. developed a cloud-based asset tracking platform that supports real-time asset monitoring and centralized data storage. Kumar and Singh introduced an RFID-enabled asset management solution for automated tracking and identification of organizational assets. Rao et al. proposed a smart asset monitoring system integrated with dashboard analytics and reporting features for better visualization and decision-making.

The literature indicates that while many systems support digital asset management, relatively few applications provide advanced features such as role-based access control, detailed asset history tracking, secure JWT authentication, and modern responsive user interfaces. Integration of search, filtering, sorting, and pagination for handling large-scale data efficiently is also limited in several existing solutions.

These observations motivated the development of a more secure, scalable, and user-friendly Asset Management System capable of efficient asset tracking, role-based management, real-time updates, and detailed activity monitoring.

EXISTING SYSTEM

In the existing attendance management system, attendance is usually recorded manually using paper registers, signature sheets, or ID card verification methods. Teachers or administrators have to spend extra time marking attendance and maintaining records, which makes the process slow and inefficient. Manual systems are also prone to errors, data loss, and fake or proxy attendance. In some organizations, biometric systems such as fingerprint scanners are used, but they require physical contact and dedicated hardware, which can increase maintenance costs and reduce convenience. These traditional methods lack automation, real-time monitoring, and efficient data management, creating the need for a smarter and more reliable attendance system.Security is another major limitation of existing systems. Many applications do not implement secure authentication and authorization mechanisms, making sensitive organizational data vulnerable to unauthorized access. Furthermore, lack of proper activity logs and tracking features reduces accountability and transparency in asset operations. Due to these limitations, organizations face challenges in efficiently managing their assets, monitoring usage, and maintaining accurate records. These drawbacks

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highlight the need for a modern, secure, and automated Asset Management System.

PROPOSED SYSTEM

The proposed **Smart Attendance Auto Marker** system is designed to automate the attendance process using facial recognition and artificial intelligence technologies. In this system, a camera captures the live image of a person, and the system compares the face with the stored database to identify the individual. Once the face is recognized successfully, attendance is automatically marked with the current date and time.

The system provides a fast, accurate, and secure method of attendance management without requiring manual effort or physical contact. It reduces the chances of proxy attendance, saves time for teachers and administrators, and maintains digital attendance records efficiently. The proposed system also includes features such as attendance report generation, real-time monitoring, and user-friendly interfaces, making it suitable for schools, colleges, offices, and other organizations.

Unlike existing systems, the proposed solution ensures better security, transparency, scalability, and usability. It minimizes manual work, reduces errors, improves accountability, and provides a centralized platform for efficient asset management and tracking.

SYSTEM REQUIREMENTS

The Smart Attendance Auto Marker system requires both hardware and software components for proper functioning. The hardware requirements include a computer or laptop with a good processor, a webcam or CCTV camera for capturing facial images, sufficient RAM and storage, and an internet connection if cloud storage or online access is used. Internet Connection: Required for package installation and database connectivity

6.2 Software Requirements

The Asset Management System is designed using a modern **client-server architecture** that ensures secure communication, efficient asset handling, and smooth interaction between the frontend, backend, and database components. The architecture follows a modular approach where each module is responsible for performing specific tasks such as user authentication, asset management, role-based access control, history tracking, and database operations. This structured design improves scalability, maintainability, security, and overall system performance.

The system architecture mainly consists of the following components:

- Frontend Module
- Backend Module
- Authentication & Authorization Module
- Asset Management Module
- Asset History Module
- Database Module
- Dashboard & Analytics Module

The **Frontend Module** provides an interactive and user-friendly interface through which users can register, log in, manage assets, search records, and view dashboards. The frontend is developed using **Next.js and Tailwind CSS**, providing a responsive and modern UI. Different interfaces are displayed based on user roles such as Admin, Manager, and Employee. The frontend communicates with the backend using RESTful APIs.

The **Backend Module** manages the core functionality of the system. It processes client requests, performs business logic, validates data, and communicates with the database. Developed using **Node.js and Express.js**, the backend acts as the central controller that connects all modules together. It handles operations such as asset CRUD functionality, user authentication, role management, and asset history logging.

The **Authentication & Authorization Module** is responsible for securing the system. It verifies user credentials during login and generates **JWT (JSON Web Tokens)** for authenticated sessions. Passwords are encrypted using **bcrypt.js** before storage. This The software requirements include an operating system such as Windows or Linux, programming languages like Python or JavaScript, and development tools such as VS Code. The system also requires libraries and frameworks like OpenCV,

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Deep Face, TensorFlow, or face recognition modules for facial detection and recognition. A database such as MySQL or MongoDB is needed to store user and attendance records, while web technologies like React, Node.js, or Express.js can be used for creating the user interface and backend services. The **Dashboard & Analytics Module** provides summarized information and visual representation of asset data. It displays statistics such as total assets, assigned assets, available assets, and assets under maintenance. Charts and tables help users analyze asset distribution and monitor organizational resources effectively.

Overall, the system architecture of the Asset Management System provides a secure, scalable, and efficient framework for managing organizational assets. By integrating authentication, role-based access, asset tracking, history monitoring, and responsive user interfaces, the system delivers a centralized and reliable solution for modern asset management.

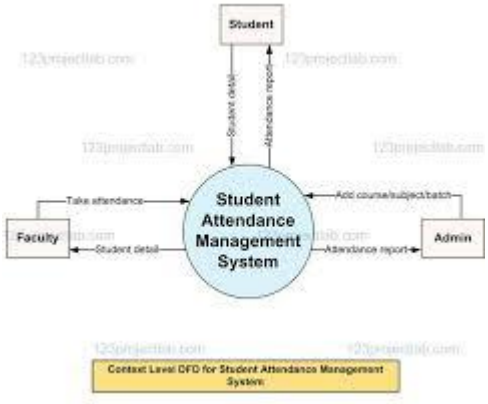

Fig 1: System Architecture Diagram

DATA FLOW DIAGRAM

n the Smart Attendance Auto Marker system, the data flow begins when the camera captures the live image of a student or employee. The captured image is then sent to the facial recognition module, where the face is detected and compared with the stored database of registered users. If the face matches successfully, the system verifies the identity of the person and automatically marks attendance with the current date and time.modules, and stored in the database. The DFD provides a clear understanding of how registration details, location data, risk predictions, and emergency alerts are handled by the system.

After attendance is recorded, the data is stored in the attendance database for future reference. The administrator or teacher can then access the stored records through the system interface to monitor attendance, generate reports, and manage user details. This entire process happens automatically in real time, making attendance management fast, accurate, and efficient.

After registration, the user logs into the application using valid credentials. Once authenticated, the user gains access to the dashboard, where features such as Safety Check, Manual SOS, and Alert History are available.

When the user performs a Safety Check, the application retrieves the current GPS coordinates and collects contextual parameters such as traffic density, crowd level, road condition, street-light availability, time of day, and historical crime data for the selected location.

These parameters are forwarded to the Machine Learning Module, which analyzes the input data and predicts the safety status of the current environment. The output is classified into one of three categories: Safe, Moderate Risk, or High Risk.

The predicted result is displayed immediately on the user dashboard and simultaneously stored in the database along with the timestamp and location details.

If the predicted result is High Risk, the system automatically activates the SOS Alert Module. The user may also manually trigger the SOS button at any time if they feel unsafe.

The SOS Alert Module generates an emergency message containing the user's name, current time, risk level, and live Google Maps location link. This message is sent to all registered emergency contacts through WhatsApp. The alert details are also recorded in the database for future reference.

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The Emergency Contacts receive the alert and can use the live location link to track the user's exact position and provide immediate assistance.

The Admin Module continuously interacts with the database to monitor registered users, safety checks, and alert activities. Administrators can review historical records, analyze system usage, and ensure the proper functioning of the application.

Security is maintained throughout the data flow process. User credentials, contact information, location logs, and alert records are stored securely, and access to administrative functions is restricted to authorized users only.

The DFD helps in understanding how information moves through the Women Safety Tracker App and how different modules cooperate to provide proactive safety monitoring and emergency communication.

Overall, the Data Flow Diagram demonstrates the complete flow of data from user registration to risk prediction and emergency alert generation, ensuring a secure, intelligent, and efficient women safety system.

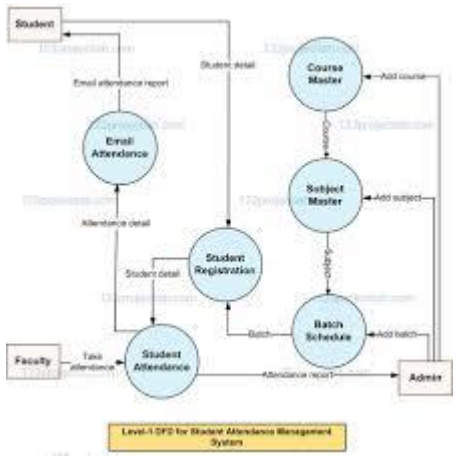

Fig 2: Data Flow Diagram

DATABASE DESIGN

A Data Flow Diagram (DFD) is a graphical representation used to show how data moves within a system. It explains the flow of information between users, processes, databases, and system modules. The DFD helps in understanding how the Asset Management System collects, processes, stores, and retrieves data during different operations. It provides a clear overview of the interaction between the frontend, backend, and database components of the system. In the Asset Management System, the DFD illustrates the movement of data from users such as Admins, Asset Managers, and Employees to the application modules. Users perform actions like registration, login, asset creation, asset assignment, asset updating, and asset searching through the frontend interface. These requests are sent to the backend server, where the business logic is processed and validated before interacting with the database.

The backend communicates with the MongoDB database to store and retrieve information related to users, assets, assignments, and asset history. Whenever an asset is added, updated, deleted, or assigned to an employee, the system records the activity in the database. The backend then sends the processed response back to the frontend so that users can view updated information in real time. The DFD also represents important functionalities such as authentication and role-based access control. During login, user credentials are verified through the authentication module, and JWT tokens are generated for secure access. Based on the user role, the system provides different permissions and dashboard functionalities. The DFD therefore helps in visualizing the complete workflow of the system and ensures proper understanding of how the Asset Management System operates efficiently and securely.

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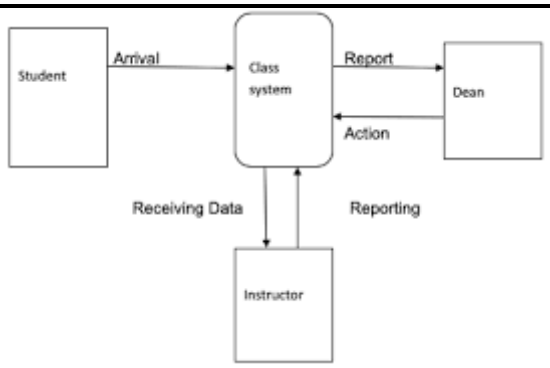

Fig 3: Database Structure

3. MODULE DESCRIPTION

3.1 User Registration Module

The **User Registration Module** is an important part of the Smart Attendance Auto Marker system. This module is responsible for registering new users such as students, employees, or staff members into the system. During registration, the user's personal details like name, ID, department, and contact information are entered into the database. The system also captures and stores facial images of the user through a camera for future face recognition. The captured facial data is processed and saved securely in the database, which helps the system identify the user during attendance marking. This module ensures that only authorized and registered users can access the attendance system. It also provides features for updating or deleting user information whenever required, making the system organized, secure, and easy to manage.

3.2 Asset Management Module

The Asset Management Module is responsible for managing and maintaining the hardware and software resources used in the Smart Attendance Auto Marker system. This module keeps records of devices such as cameras, computers, servers, and other equipment required for the attendance system. It also monitors the status and availability of these assets to ensure smooth system operation.records efficiently. Each asset contains details such as name, category, status (Available, Assigned, Maintenance), and assigned user information.

3.3 The module helps administrators track device details, maintenance schedules, and system updates efficiently. It can also manage software components, database backups, and security settings to improve system reliability and performance. By organizing and monitoring all resources properly, the Asset Management Module ensures that the attendance system functions continuously and effectively without technical interruptions.Asset Assignment Module

The Asset Assignment Module is responsible for assigning assets to users (employees) and managing their allocation within the system. It allows authorized users (Admin or Manager) to assign available assets to specific users based on requirements.

When an asset is assigned, its status is automatically updated from **"Available" to "Assigned"**, and the assigned user information is stored in the database. Similarly, when an asset is unassigned or returned, the status is updated accordingly.

3.4 Search, Filter and Sorting Module

The **Search, Filter, and Sorting Module** enhances the usability of the Asset Management System by enabling users to quickly find and organize asset data. It allows users to **search assets by name**, making it easier to locate specific records from large datasets.

The module also provides **filtering options** based on attributes such as category and status (Available, Assigned, Maintenance), helping users narrow down results according to their needs. Additionally, **sorting functionality** allows users to arrange assets in ascending or descending order based on fields like creation date or name.

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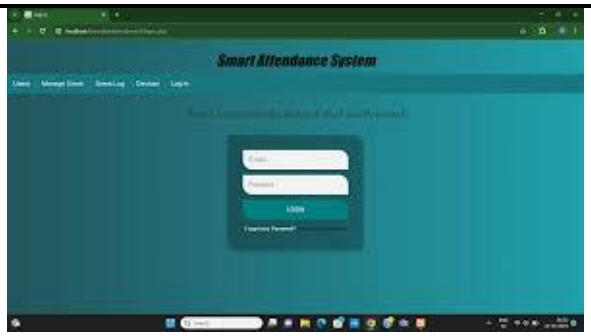

Fig 4: User Registration Interface

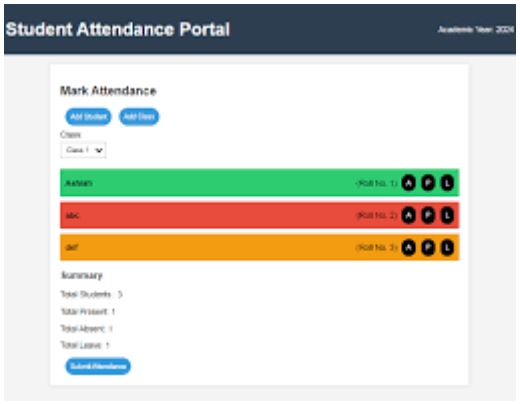

Fig 5: Asset management Dashboard Page

IMPLEMENTATION

The implementation of the **Smart Attendance Auto Marker** system involves developing and integrating both hardware and software components to automate attendance management. The system is implemented using technologies such as Python, OpenCV, DeepFace, and database management systems. A camera is connected to the system to capture live facial images of users. These images are processed using facial recognition algorithms to identify registered individuals..

The frontend implementation provides a responsive and user-friendly interface for administrators, The user registration module stores personal details and facial data in the database. During attendance marking, the system compares the live image with the stored data and automatically records attendance with date and time information. The attendance records are then saved securely in the database and can be accessed through a user-friendly interface for monitoring and report generation.

The implementation process also includes testing the system for accuracy, speed, and security to ensure reliable performance. By integrating artificial intelligence and real-time data processing, the system provides an efficient, accurate, and automated attendance management solution.

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The implementation also includes API testing and debugging using Postman to ensure correct communication between frontend and backend modules. Error handling mechanisms are implemented to display appropriate messages during invalid operations or failed requests. Overall, the implementation of the Asset Management System provides a secure, scalable, and efficient solution for managing organizational assets digitally.

TECHNOLOGY USED

The Smart Attendance Auto Marker system is developed using various modern technologies for efficient and accurate attendance management. The programming language used is Python, which handles the core functionality of the system. OpenCV is used for image processing and face detection, while DeepFace or other facial recognition libraries are used for identifying individuals.JavaScript / TypeScript – Used for frontend logic and component development. The backend can be developed using Node.js and Express.js to manage server-side operations and APIs.The Smart Attendance Auto Marker system is developed using various modern technologies for efficient and accurate attendance management. The programming language used is Python, which handles the core functionality of the system. OpenCV is used for image processing and face detection, while DeepFace or other facial recognition libraries are used for identifying individuals.

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RESULTS AND DISCUSSION

The **Smart Attendance Auto Marker** system successfully automates the attendance process using facial recognition technology. The system is capable of detecting and recognizing registered users accurately and marking their attendance automatically with date and time details. The implementation of the project reduces manual work, saves time, and minimizes errors compared to traditional attendance methods.

During testing, the system showed fast response time and reliable performance in recognizing faces under normal lighting conditions. It also helped prevent proxy attendance and maintained attendance records securely in a digital database. The generated attendance reports made monitoring and management easier for administrators and teachers.

The discussion of the project highlights that the use of artificial intelligence and image processing improves efficiency and transparency in attendance management. However, factors such as poor lighting, camera quality, or incorrect face positioning may affect recognition accuracy. Overall, the project provides a smart, secure, and efficient solution that can be effectively used in schools, colleges, offices, and other organizations.

ADVANTAGES OF THE SYSTEM

- The **Smart Attendance Auto Marker** system provides many advantages over traditional attendance methods. It automates the attendance process, which reduces manual work and saves valuable time for teachers, administrators, and employees. The system improves accuracy by using facial recognition technology and helps prevent proxy or fake attendance.sorting, and pagination
- Built using MERN stack, ensuring high performance and scalability
- Offers a user-friendly interface for better.

FUTURE ENHANCEMENTS

The Smart Attendance Auto Marker system can be further improved by adding advanced features and technologies in the future. The system can be integrated with cloud storage to provide secure online access and backup of attendance records. Mobile application support can also be added so that administrators and users can monitor attendance from anywhere.

Future versions may include AI-based analytics to generate detailed attendance reports and performance insights automatically. GPS and geolocation features can be integrated for location-based attendance tracking. The system can also be enhanced with mask detection, voice recognition, and multi-camera support for better security and accuracy.

CONCLUSION

The **Smart Attendance Auto Marker** project provides a modern and efficient solution for attendance management using facial recognition technology and artificial intelligence. The system automates the attendance process, reduces manual effort, saves time, and improves accuracy compared to traditional methods. It also helps prevent proxy attendance and maintains secure digital records with real-time data processing.

The project demonstrates how smart technologies can simplify attendance tracking in schools, colleges, offices, and organizations. With features such as automatic attendance marking, report generation, and secure data storage, the system increases transparency and reliability. Overall, the Smart Attendance Auto Marker is a fast, user-friendly, and effective attendance management system that can be further enhanced for future real-world applications.

Overall, the Asset Management System improves operational efficiency, reduces manual workload, increases transparency, and ensures better utilization of organizational resources. It provides a reliable and scalable solution that can be adapted to different organizational needs.

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