

## Smart AI-powered Attendance and Engagement Monitoring System

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**ABSTRACT** - This project presents a Smart AI-Powered Attendance and Engagement Monitoring System integrated with Artificial Intelligence and face recognition technology. The system automates attendance recording while improving accuracy, security, and classroom monitoring. It identifies registered students through real-time facial recognition and records attendance automatically without requiring manual intervention. The application uses a webcam and computer vision techniques to detect, recognize, and verify faces, ensuring that only authorized individuals are marked present. If an unregistered person is detected, the system identifies them as "Unknown", preventing proxy attendance and unauthorized access.

Traditional attendance methods, such as manual registers, biometric devices, or RFID cards, are time-consuming, prone to human errors, and vulnerable to proxy attendance. These methods also require physical interaction and additional administrative effort to maintain

attendance records. There is a growing need for an intelligent, contactless, and automated attendance management system that can provide accurate identification, minimize manual work, and maintain secure attendance records in real time. The proposed system is developed using Python, Flask, OpenCV, and the face\_recognition library. Attendance data, including the student's name, date, and time, is automatically stored in a CSV file for future reference.

**KEYWORDS:** Artificial Intelligence (AI), Face Recognition, Attendance Monitoring, Student Engagement, Computer Vision, OpenCV, Face Authentication, Real-Time Detection, Image Processing, Flask.

### INTRODUCTION

Attendance management plays a vital role in educational institutions and organizations, where maintaining accurate attendance records is essential for monitoring participation and improving efficiency. Traditional attendance methods, such as manual registers and ID card-based

systems, are time-consuming, prone to human errors, and susceptible to proxy attendance. Recent advancements in Artificial Intelligence (AI) and Computer Vision have enabled the development of intelligent face recognition systems that automate attendance with high accuracy. The Smart AI-Powered Attendance and Engagement Monitoring System uses AI-based facial recognition to identify registered users in real time through a webcam. The system compares detected faces with a trained facial database and automatically records attendance with the user's name, date, and time in a CSV file. Unregistered users are identified as unknown, preventing unauthorized attendance.

## **LITERATURE SURVEY**

The rapid advancement of Artificial Intelligence (AI), Computer Vision, and Machine Learning has significantly improved the development of automated attendance management systems. Traditional attendance methods, such as manual registers, biometric fingerprint devices, and RFID-based systems, often suffer from drawbacks including time consumption, proxy attendance, and maintenance costs. To overcome these limitations, researchers have introduced face recognition-based attendance systems

that provide secure, contactless, and real-time attendance monitoring.

The Smart AI-Powered Attendance and Engagement Monitoring System builds upon these advancements by providing an automated, user-friendly, and efficient attendance solution. It captures live video through a webcam, recognizes registered users, records attendance with date and time in a CSV file, and identifies unknown users to prevent unauthorized attendance. The system reduces manual effort, minimizes human errors, improves security, and offers a reliable solution for educational institutions and organizations seeking intelligent attendance management.

## **RELATED WORK**

Several researchers have developed AI-based attendance management systems to improve the efficiency, accuracy, and security of attendance recording. Earlier attendance methods, such as manual registers, RFID cards, and fingerprint-based biometric systems, were widely used but had limitations, including time consumption, hardware dependency, and the possibility of proxy attendance. With the advancement of Artificial Intelligence (AI) and Computer Vision, face recognition technology has emerged as an effective solution for automated attendance management. Modern systems use facial feature extraction and matching algorithms

to identify registered users in real time with high accuracy. Many researchers have implemented these systems using Python, OpenCV, dlib, and face recognition libraries to achieve fast and reliable performance. The Smart AI-powered Attendance and Engagement Monitoring System builds upon these developments by combining real-time face recognition with automated attendance recording and engagement monitoring. This approach minimizes manual effort, prevents unauthorized attendance, improves record accuracy, and provides a secure, contactless, and user-friendly solution for educational institutions and organizations.

## **EXISTING SYSTEM**

The existing attendance management systems primarily depend on manual attendance registers, RFID cards, fingerprint scanners, or ID card-based methods to record attendance. These methods require physical interaction and consume considerable time, especially in classrooms or organizations with a large number of users. Manual attendance is prone to human errors, duplicate entries, and proxy attendance, reducing the accuracy of attendance records. Fingerprint-based systems require regular maintenance and may face hygiene concerns, while RFID and ID cards can be lost, damaged, or misused by others. Most

traditional systems do not use Artificial Intelligence for automatic user identification and lack real-time face recognition capabilities. They are unable to identify unknown users or monitor engagement effectively. Attendance records often require manual verification and management, increasing administrative workload. Overall, the existing systems lack intelligent automation, contactless operation, real-time monitoring, enhanced security, and accurate attendance management, making them less suitable for modern educational institutions and organizations.

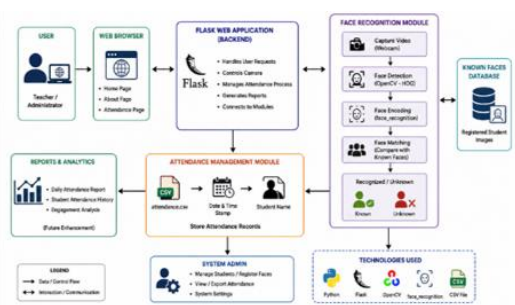
## **PROPOSED SYSTEM**

The proposed Smart AI-powered Attendance and Engagement Monitoring System utilizes Artificial Intelligence and face recognition technology to automate attendance recording efficiently and accurately. The system captures live video through a webcam and continuously detects faces in real time. It extracts unique facial features from the detected face and compares them with the trained facial database to identify registered users. When a match is found, the system automatically records the user's attendance along with the current date and time in a CSV file. If no matching face is found, the system labels the individual as an unknown user and does not record attendance, preventing

unauthorized access and proxy attendance. The system also monitors user presence to support engagement tracking during sessions. A simple and interactive interface allows users to start and stop the recognition process with ease. By eliminating manual attendance methods, the proposed system reduces human errors, improves security, enhances accuracy, and provides a fast, reliable, contactless, and user-friendly attendance management solution for educational institutions and organizations.

## SYSTEM ARCHITECTURE

The architecture of the Smart AI-powered Attendance and Engagement Monitoring System. The system captures live video through a webcam and detects faces using AI-based face recognition. The detected face is compared with the registered face database to identify the user. If a match is found, the attendance is automatically recorded with the current date and time in the CSV file. This architecture provides a secure, accurate, and automated attendance management solution.



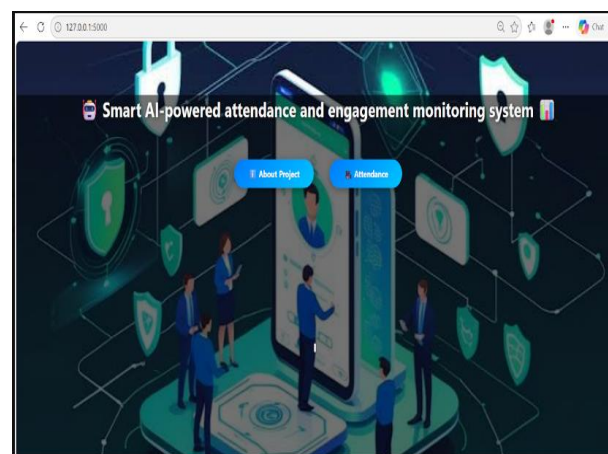
**Fig-1 System Architecture**

## METHODOLOGY DESCRIPTION

The Smart AI-powered Attendance and Engagement Monitoring System uses Artificial Intelligence and face recognition to automate attendance. It captures images, detects and recognizes faces, verifies users, records attendance automatically, and monitors user engagement efficiently and securely.

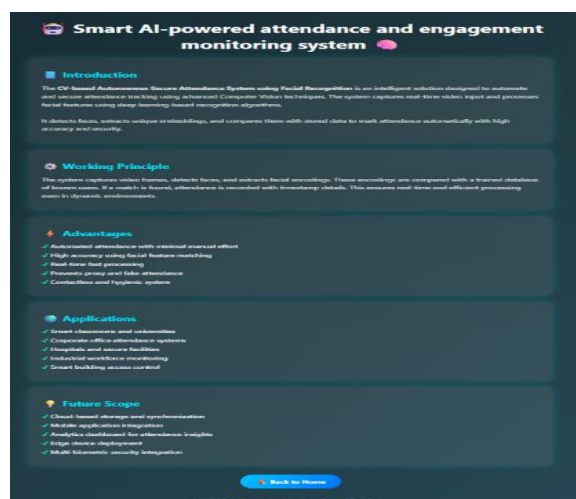
## RESULTS AND DISCUSSION

The Smart AI-powered Attendance and Engagement Monitoring System successfully recognized registered users and recorded attendance automatically. It improved attendance accuracy, reduced manual effort, and prevented proxy attendance through AI-based face recognition.



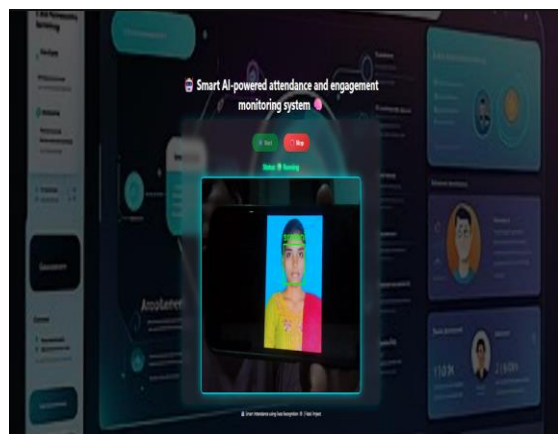
**Fig: 2 Home Page**

The above figure shows the home page of the Smart AI-powered Attendance and Engagement Monitoring System with navigation options to access the project information and attendance module.



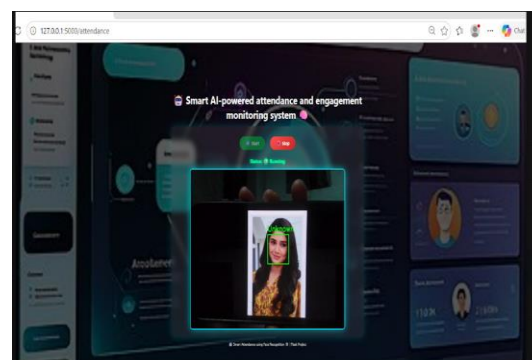
**Fig 3: About Page**

The above figure shows the About Project page of the Smart AI-powered Attendance and Engagement Monitoring System, presenting the project's introduction, working principle, advantages, applications, and future scope in a simple and user-friendly interface.



**Fig 4: Known User**

The above figure shows the successful recognition of a registered user, where the system identifies the face and automatically records attendance in real time.



**Fig 5: Unknown User**

The above figure shows the detection of an unknown user, where the system recognizes that the face is not registered and prevents attendance from being recorded.

## CONCLUSION

The Smart AI-powered Attendance and Engagement Monitoring System automates attendance using AI-based face recognition. It accurately identifies registered users, records attendance in real time, prevents proxy attendance, and reduces manual effort. The system provides a secure, reliable, contactless, and efficient attendance management solution for educational institutions and organizations.

## FUTURE SCOPE

The Smart AI-powered Attendance and Engagement Monitoring System can be enhanced by integrating cloud databases, mobile applications, and advanced deep learning models for improved accuracy. Future improvements may include real-time analytics, automated attendance

reports, multi-camera support, and enhanced engagement monitoring to provide a more intelligent and scalable attendance management solution.

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