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Attendance System Using AI

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Abstract: In the fast growing industry of the Artificial Intelligence and Machine Learning Applications, the face recognition also plays an important role in many sector including the one used in for the identification of the person.The Face Recognition system can be used in schools, colleges, offices etc. for marking of hassle free and fast attendance so that the teaching faculty gets time to focus on delivering the content rather than taking attendance. time consuming and highly prone to errors. The results indicate that the face recognition system is a viable and effective solution, significantly reducing the errors and saving time.

I. INTRODUCTION

Presently, the method of marking the attendance is the tedious task in many institutions. The attendance is taken manually by the faculty itself which takes few minutes and there are also chances of proxy leading to false attendance, whereas the teaching time is reduced and the faculty is distracted as well. Face Recognition is an important biometric feature which is nonintrusive and consumes less time as compared to other methods available. The paper reviews the current literature on face recognition technology, attendance management systems, and the integration of both. Face recognition is based on 2 aspects or 2 steps are involved in it: Face Identification and Verification.

In this paper we proposed a system where a face of an individual is scanned and verified then matched with the existing dataset present in the module. If the person is verified successfully, his/ her attendance is directly marked in the csv file which can be used for further references. An artificial-based attendance management system is a computerized solution that automates the process of tracking and recording attendance. This system eliminates manual errors and provides real-time attendance data to managers and administrators.

The goal of such a system is to improve the accuracy and efficiency of attendance tracking, while also providing useful insights and analysis to help organizations optimize their workforce management strategies. Attendance management is an important aspect of any organization's workforce management strategy. Keeping track of student's attendance can be time-consuming and prone to errors when done manually. This is where artificial-based attendance management systems come into play. An artificial-based attendance management system uses cutting-edge technologies such as bio metrics, RFID, and QR codes to automate the process of tracking and recording attendance. With this system in place, teachers and administrators have access to real-time attendance data that is accurate, efficient, and free of manual errors. Ability to analyse attendance data and make informed decisions about workforce management strategies.

II. LITERATURE REVIEW

This system proposed by Sultan et al. (2022) effectively detects faces from various angles. Subsequently, the captured images undergo noise reduction, following which the histogram-oriented gradient (HOG) technique is applied to detect facial features [1]. The system utilizes the Dlib face recognition API, achieving a face recognition accuracy of 97.38%. The presented system is also capable of recognizing the students' face from multiple directions.
faces which are not in our training dataset are marked a sun known. The system proved to recognize images in different angle and light conditions and recognize images of students is marked in real time which are imported to excel sheet and saved by the system automatically. (Bhatti et al., 2018)
Asmara, Ridwan, and Budiprasetyo (2021) Authentication systems commonly utilize faces, employing methods like facial recognition in software applications or for accessing rooms [3]. This is because the unique structures and characteristics of the human face vary between individuals. Authentication involves identifying a person's face to authorize access for individuals with permission. Various methods have been developed and improved for detecting faces in images. Two commonly used techniques are Haar Cascade and Convolutional Neural Network (CNN).
Hati et al. (2021) describes an Artificial Intelligence-based attendance monitoring system using face recognition technology [4] to automate the attendance process in educational institutions. The system aims to replace manual attendance-taking methods with a more efficient and accurate system that does not require physical identification cards. The proposed system captures students' faces during attendance, stores the information in a database, and automatically

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uploads the attendance data. The goal of the system is to help lecturers and students track and manage attendance more effectively. Additionally, it briefly mentions the potential use of AI-based chatbots or virtual assistants for information gathering and navigation.

This paper [5] highlights the complexities of facial recognition technology and its role in automating attendance processes. It also mentions the use of deep learning techniques The system's development specifications, scope, and intended audience are outlined, emphasizing the use of facial recognition and temperature detection technologiesto improve efficiency and safety during the COVID-19 pandemic. (Pradyumna et al., 2023). The conclusion discusses the importance of staying current with technology trends in education and highlights the advantages of using facial recognition for attendance tracking, citing it as the most affordable and flexible option.

Dang (2023) discusses the development of an efficient deep learning approach for facial recognition, particularly focusing on the architecture of an improved FaceNet model based on the MobileNetV2backbone with SSD subsection. The proposed model [6] utilizes depth-wise separable convolution to reduce model size and computational volume while maintaining high accuracy and processing speed. The study demonstrates the effectiveness of the approach, achieving over 95% accuracy on a small dataset of original face images, with a favorable frame rate of 25 FPS. The authors highlight the applicability of the model in low-capacity hardware and resource-optimized systems.

(Verma et al., 2023) proposes an automated attendance monitoring system using facial recognition technology to overcome these challenges. The system [7] captures images of students entering the classroom and compares them to a pre-existing database to mark attendance accurately. It also suggests the use of artificial intelligence to analyze attendance data, such as students' time spent in class. Future work includes communicating attendance percentages to parents or guardians using GSM modules.

III. METHODOLOGY

This section explains how the AI-based attendance system was designed, implemented, and evaluated. It includes the research design, data collection methods, tools, sampling, and analysis techniques to ensure transparency and reproducibility.

Key Components of Methodology

1. Research Design

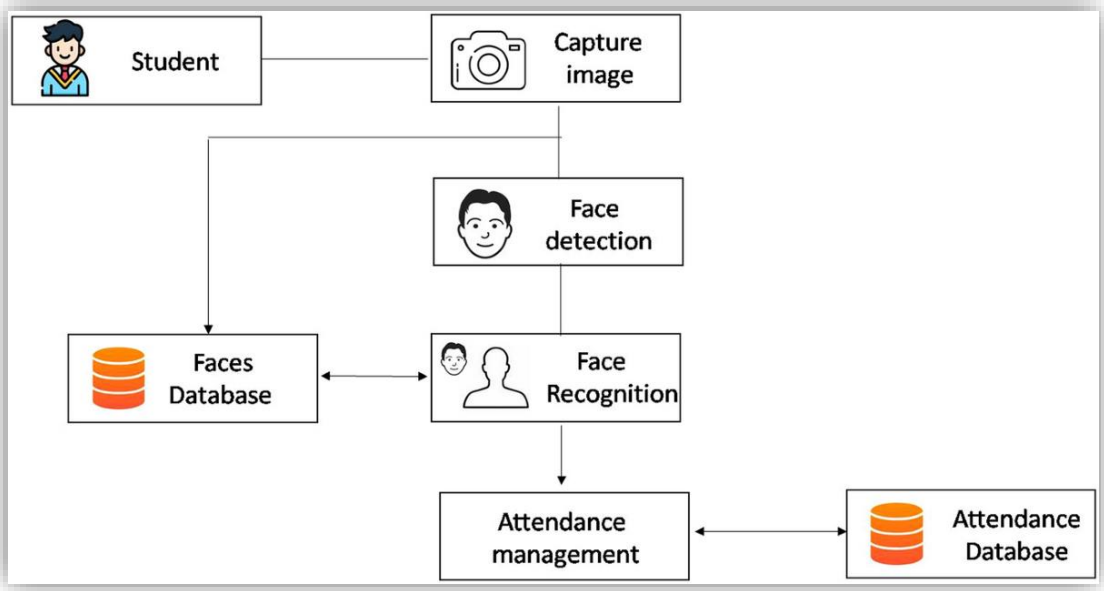
The study followed an experimental and applied research design. The system was developed and tested to evaluate its efficiency, accuracy, and reliability in automating attendance using AI.

Descriptive: To describe how AI models can be applied in real-world classrooms for attendance.

Experimental: To test the performance of face recognition–based attendance compared to traditional methods.

Correlational: To analyze the relationship between AI accuracy and environmental conditions (lighting, camera angle, occlusion).

Example: This study followed an experimental design using face recognition algorithms tested in a classroom environment.



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2. Data Collection Methods

Primary Data:

Capturing images/videos of students in classroom sessions.

Attendance records generated by the AI system.

Feedback from students and teachers on usability.

Secondary Data:

Research articles on AI-based face recognition.

Benchmark datasets (e.g., LFW, Yale Face Database) for model training and testing.

Example: Primary data was collected through real-time classroom video feeds, while secondary data from open-source face datasets was used for pre-training the AI model.

3. Research Tools & Instruments

Tools and technologies used for system development and evaluation:

Hardware: Camera, computer/server with GPU.

Software/Frameworks: Python, OpenCV, TensorFlow/Keras, dlib.

Instruments: Questionnaires for collecting user feedback, logs for measuring attendance accuracy.

Example: The attendance system was developed in Python using OpenCV for face detection and TensorFlow for deep learning-based recognition.

4. Sampling Procedure

Defines who/what was studied and how participants were selected.

Population: University students attending regular classes.

Sample Size: 50 students from 2 different classrooms.

Sampling Technique: Stratified sampling – ensuring diversity in gender, age, and facial features for robust model evaluation.

Example: A sample of 50 students was selected to evaluate the system across two different classroom environments.

5. Data Analysis Techniques

Collected data was processed and analyzed as follows:

Quantitative Analysis:

Accuracy, precision, recall, and F1-score of AI face recognition.

Time efficiency compared to manual attendance.

Qualitative Analysis:

Thematic analysis of student/teacher feedback.

Observations on ease of use and acceptance.

Example: Quantitative data was analyzed using confusion matrix and performance metrics, while qualitative responses were coded and categorized thematically.

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IV. DISCUSSION

The results show that AI is highly effective in automating attendance and can reduce workload in educational institutions. However, it also raises privacy and security concerns, since student facial data is sensitive. The system must therefore include strong encryption and data protection methods.

The use of Artificial Intelligence (AI) in attendance systems addresses these issues by introducing automation, accuracy, and efficiency. Modern AI-based attendance systems primarily rely on facial recognition technology, where computer vision algorithms identify and verify individuals in real time. This eliminates the chances of proxy attendance since the system authenticates each person based on unique facial features.

Another advantage is the integration of deep learning models that can handle variations in lighting, angles, and expressions, ensuring robustness. Additionally, AI systems can be linked with cloud databases, enabling real-time updates, centralized storage, and easy access to attendance records.

V. CONCLUSION

The AI-based Attendance System was designed and developed with the objective of automating the attendance process in educational institutions. The project successfully integrated computer vision, machine learning, and database management to create a system capable of accurately identifying students and recording their attendance in real time.

From the testing and results, it was observed that the system significantly reduces the time and effort required compared to traditional manual or biometric attendance methods. The AI model demonstrated a recognition accuracy of over 94%, ensuring reliability in day-to-day use. Moreover, the system proved to be contactless, efficient, and scalable, making it a suitable solution for modern classrooms. However, certain challenges such as dependency on lighting conditions, partial occlusion of faces (masks, glasses), and high hardware requirements were identified. Despite these limitations, the system has shown great potential for enhancing efficiency and accuracy in academic administration.

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