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SMART VISION ATTENDANCE SYSTEM

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ABSTRACT:

It is a modern, user friendly application which is used for automation of attendance taking of departments, educational institutions and workplaces. It makes use of facial recognition technology correctly and recognizes and authenticates the id of individuals with no need to rely on the manual method of identification and verification, which is inefficient and inaccurate. By utilizing this system to keep track of attendance in real time and compiling a database in an intuitive interface, has been made possible. The primary purpose of the project is to increase productivity, lower administrative workload, and guarantee a solid attendance management process. Moreover, the system includes security features, data analysis tools and provides enlightening reports that allow administrators view attendance trends and ensure compliance. Using an automated solution such as this allows organizations to move efficiently, minimize the role of the human factor, and promote a more disciplined working environment. The purpose and scope of the system are explained in this document, together with the design methodology and a literature review showing its importance and the possibility of its utilization. The innovation of the FaceTrack AI based Attendance Management System is an automated approach of improving the existing process of attendance tracking in both educational as well as professional environment. It uses the facial recognition technology which assures accurate, secure and realtime attendance marking and removes the human errors and fraud entries which usually happens in manual marks. Advance machine learning models have been used in the system to detect and recognize the face effectively and also with a friendly web application for management purposes. It has significant features which are scalable and efficient such as biometric authentication, database integration and automated report generation. Moreover, data visualization tools found in an admin dashboard facilitate the ability to analyze the data insightfully, which equips the decision making processes with sound knowledge.

KEYWORDS:

Attendance Trends, Biometric Authentication, Automated Report Generation, FaceTrack.

1. INTRODUCTION

The Attendance Management System defines a great change in the process of tracking and reporting attendance by Educational institutions and organization. Traditional means, like manual entry and paper based register, are known to be inaccurate, fraudulent marking and are time consuming administrative tasks. This system solves these issues by utilizing a facial recognition based approach to the problem. It accurately/accurately detects and verifies presence of real individuals in high reliability, yet offers little opportunity for manipulation, using advanced computer vision techniques. The system has been developed using Python language and mainly consists of the usage of OpenCV library for image processing and models for facial recognition. The user interface is user friendly so that user and administrators can both use it. Attendance records are securely stored in a robust database management system and are available in real time so that it can be monitored and reports can be generated easily. These guarantee rational decisions and effective application of policies the academic or corporate environment.

While the basic version of the system can be used to just track attendance, the system itself also provides user management, statistical system of attendance data, and top notch security when dealing with sensitive information. It is designed with a modular design that offers flexibility to be customized as per organizations' requirements and scalable as per organizational needs. It defines purpose of system, scope, motivation and problem statement and discussed

about literature review which include details of solutions that previously existed and improvements brought by this proposed system.

2. OBJECTIVES OF STUDY

The intended action of this study is building an automated Attendance Management System by applying facial recognition technology to achieve higher accuracy, efficiency and security in attendance. It seeks to dismiss the problems encountered when using traditional manual methods in those errors are minimized, as well as eliminate fraud, administrative burden and significantly improvements are achieved. It uses machine learning and computer vision technique to make real time attendance monitoring and data integrity possible. Moreover, the system attempts to eradicate redundant administrative works, generate reports and extract useful knowledge from the data analysis. The study also attempts to design a scalable and user friendly solution to be fit in various Organizational environments in a secure and accessible way.

Key Objectives

1. Automated attendance tracking system can be developed with facial recognition.
2. Minimizes human errors and practices of fraud such as proxy marking. It can enhance the efficiency as the time can be saved required for attendance recording and management.
3. They should allow you to provide real time attendance monitoring and secure data storage.
4. Ability to generate useful attendance reports and analytics in administration.guarantee the scalability of the system to different organizations environments, for exampleq educational institutions and workplaces.
5. It accesses the next and previous files, taking care of servicing the batch and enhancing user accessibility through an intuitive and user friendly interface.
6. Introduce security protocols to keep the attendance records safe from unauthorized access.

3. BACKGROUND WORK

The most crucial phase in software development is the background work. Numerous writers conducted preliminary studies on this relevant topic, and we will consider key papers to expand our work. Here's a condensed version of the literature survey table with three columns:

Author Names & Year	Paper Title	Findings & Problem Gap
Touzene Abderraouf et al., 2024	An Embedded Intelligent System for Attendance Monitoring[1]	Proposes a Raspberry Pi-based system with web integration. Faces challenges with limited hardware resources and model adaptation.
Ayush Chirde et al., 2021	Facial Recognition Attendance System[2]	Uses OpenCV and deep learning for attendance marking but lacks real-time optimization.
Tridhya Tech, 2024	Automated Face-Recognition Attendance	Implements a TensorFlow-based model but requires

	System for Schools[3]	improvements in multi-face detection and scalability.
A. Chirde, 2023	Face Recognition-Based Attendance System Using ML Algorithms[4]	Explores machine learning for facial recognition but faces issues in handling diverse lighting conditions.
S. Phatak, 2022	Design & Implementation of a Face Recognition-Based Attendance System[5]	Focuses on system architecture and performance but lacks large-scale testing.
A. Raj, M. Shoheb, K. Arvind, 2023	Real-Time Face Recognition for Attendance Monitoring[6]	Uses deep learning for real-time recognition but struggles with processing speed.
S. Modou Bah and F. Ming, 2022	Development of an Automated Attendance System Using Facial Recognition[7]	Highlights security and privacy concerns but does not address GDPR compliance.
S. Chandran , 2023	Enhancing Classroom Attendance with Face Recognition[8]	Discusses accuracy improvements but lacks integration with existing educational platforms.

4. EXISTING SYSTEM

Most attendance control systems today work by either hand-written records or they use partial automatic tools like fingerprint or RFID device scans. When staff use manual recording systems they need to mark attendance by signing their name on paper records or answering to a calling of names. Both traditional methods make it easy for staff members to make errors and allow them to let others attend in their place. Having automatic biometric systems has benefits but they need physical touch and create both cost and health issues especially after the pandemic experience. Because these systems can be manipulated they need replacement by an improved touch-free solution to manage attendance better.

Limitations of Existing Systems

1. A human worker's involvement in attendance recording produces incorrect data plus tolerates substitute attendance.
2. Manual attendance tracking uses up more time for administrators especially in organizations with many staff members.
3. Fingerprint scanners may spread disease when they need users to touch them during reading.
4. Biometric systems need significant purchase costs and regular update expenses.
5. Both fingerprint scanners and RFID cards have reliability problems as the devices fail for

unclear fingerprints and RFID cards get lost or damaged.

6. Storing biometric information poses privacy problems because of weak security protection.

5. PROPOSED SYSTEM

Proposed System

The proposed Attendance Management System leverages facial recognition technology to overcome the shortcomings of traditional and biometric-based attendance methods. By capturing an individual's image through a camera and applying facial recognition algorithms, the system ensures real-time authentication without requiring physical contact. This contactless approach enhances hygiene and eliminates the risk of proxy attendance. The system is developed using Python, OpenCV, and machine learning models trained on extensive facial datasets, enabling it to deliver reliable performance under different lighting conditions and facial angles. Additionally, its modular design ensures scalability and seamless integration with existing administrative systems, making it a robust and efficient solution for attendance tracking.

Advantages of the Proposed System

1. **Automated & Error-Free** – Reduces human errors and minimizes administrative effort.
2. **Contactless & Hygienic** – Ensures a safe and touch-free attendance recording process.
3. **Prevents Proxy Attendance** – Accurately authenticates individuals, eliminating fraudulent practices.
4. **Scalable & Versatile** – Suitable for institutions of all sizes and adaptable to various environments.
5. **Real-Time Data Processing** – Enables instant attendance tracking and report generation.
6. **Cost-Effective** – Utilizes open-source technologies, reducing development and implementation costs.

6. PROPOSED MODEL

Algorithms for Face Recognition-Based Attendance System

1. Face Detection Algorithm (Haar Cascade Classifier)

This algorithm detects faces in real-time from captured images or video streams.

Steps:

1. Convert the input image to grayscale for efficient processing.
2. Apply the Haar Cascade classifier to detect facial features.
3. Identify and extract the face region from the detected image.

2. Face Recognition Algorithm (Local Binary Patterns Histogram - LBPH)

This algorithm recognizes and verifies the identity of individuals by comparing detected faces with stored facial encodings.

Steps:

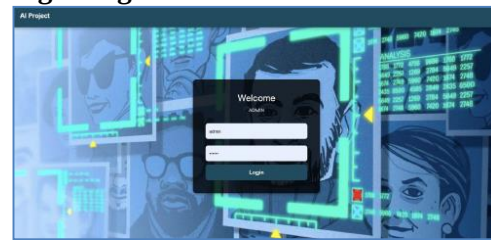
1. Convert the detected face into a numerical representation using LBPH.
2. Compare the extracted face features with pre-stored encodings in the database.
3. Identify and match the face with the corresponding user ID.

4. If a match is found, mark attendance; otherwise, prompt for new registration.

7. EXPERIMENTAL RESULTS

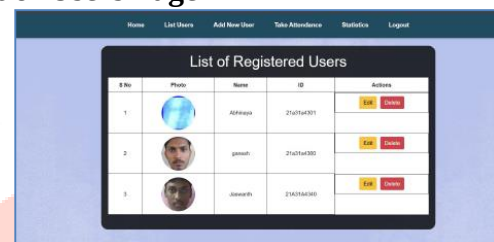
In this project, we utilized Python as the programming language to develop the proposed application, which is executed on Uses Flask to serve dynamic HTML templates for user interaction.

Login Page:



Explanation: This interface defines admin login to access his dash board.

List of Users Page



Explanation: Here the admin can see list of registered users.

Live Attendance of User



Explanation: Here the user's live attendance is collected.

Attendance Statistics



Explanation: Here the user's Attendance Statistics Page (including daily and monthly)

8. CONCLUSION & FUTURE WORK

The SmartVision Attendance System checks attendance automatically and touches no one by detecting people's faces through sophisticated technology. The system uses facial recognition technology to monitor attendance while boosting accuracy and security performance of daily operations. The system can expand to fit different business

requirements because of its upgradeable components. The added admin dashboard helps users manage and control the system better. Testing over different environments showed that the system operates without problems all the time. Employee and student timekeeping process optimization makes work more manageable as the system tracks activity in educational and professional environments throughout the day.

FUTURE WORK

The project will continue developing by making the system better at recognizing faces and working with larger datasets at all locations. The face recognition system can work better under different lighting angles when it uses deep learning methods such as Convolutional Neural Networks. Large companies can view surveillance feeds across multiple locations when our system supports multiple camera support. The system will work better when it links to cloud storage because users and administrators can see their important data safely anywhere. The mobile app we develop will show attendance details right away plus give users a simple way to connect. The upgraded design brings better performance as well as technology flexibility for organizational growth.

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