

Attendance Management System Using Face Recognition

A Project Report

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ABSTRACT

The **Attendance Management System using Face Recognition** is an advanced, automated solution designed to streamline the tracking and management of student or employee attendance. Traditional methods, such as manual roll-calls, are often time-consuming, prone to errors, and susceptible to proxy attendance. This system utilizes cutting-edge facial recognition technology to automatically identify individuals and record their presence. It works by capturing a person's facial features and comparing them against a database of pre-enrolled faces. Once recognition is successful, the system logs attendance without requiring manual input or physical intervention. The proposed solution offers high accuracy, speed, and security, while minimizing administrative burden. It also ensures that attendance records are tamper-proof and easily accessible for review or analysis. This system can be seamlessly integrated into classrooms, offices, or any organization where efficient attendance management is needed. By leveraging deep learning techniques and image processing algorithms, the system provides a reliable, efficient, and user-friendly approach to attendance tracking.

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CHAPTER 1

Introduction

1.1 Problem Statement:

Traditional attendance management systems, such as manual registers or card-based methods, are inefficient, time-consuming, and prone to human error. These methods often result in inaccurate attendance records, delayed processing, and opportunities for manipulation, such as proxy attendance. Additionally, maintaining and managing physical records for large groups of students or employees can be cumbersome and prone to data loss. There is a need for a more efficient, accurate, and secure system that automates attendance tracking while minimizing administrative overhead. The challenge is to develop a system that not only simplifies the attendance process but also provides reliable verification of individual identities to prevent fraud, reduces human involvement, and ensures real-time, tamper-proof records. This project aims to address these issues by utilizing face recognition technology, offering a solution that is fast, accurate, and scalable for educational institutions or corporate environments.

1.2 Motivation:

The motivation behind developing an Attendance Management System using Face Recognition stems from the growing need for efficient, accurate, and secure methods of tracking attendance in educational institutions and workplaces. Traditional methods of attendance management, such as manual entry or card-based systems, are increasingly inadequate in addressing modern challenges. They are not only time-consuming but also vulnerable to human errors, manipulation, and fraud, such as proxy attendance. In large organizations or classrooms, these issues can lead to administrative inefficiencies, lost productivity, and unreliable data.

By implementing such a system, institutions can also enhance security, provide better user experience, and foster a more modern and tech-savvy environment. This innovation aligns with the increasing reliance on automation and artificial intelligence in education and business sectors.

1.3 Objective:

The objective is to develop an automated attendance management system using face recognition technology to improve accuracy, prevent proxy attendance, and streamline the attendance process. The system aims to reduce administrative overhead, ensure real-time, tamper-proof records, and enhance security, providing a reliable and efficient solution for both educational and organizational environments.

1.4 Scope of the Project:

The scope of the Attendance Management System using Face Recognition includes the implementation of an automated, real-time attendance logging system based on facial recognition technology. It ensures secure, tamper-proof data storage and offers a user-friendly interface for both administrators and users. The system will be scalable for various group sizes, suitable for educational institutions and workplaces. It also includes data analytics for attendance trends and can integrate with existing platforms or databases. The solution ensures accuracy, efficiency, and security in attendance management.

CHAPTER 2

Literature Survey

2.1 Review of Relevant Literature or Previous Work: Previous research indicates that face recognition technology offers a highly efficient, accurate, and secure solution for automated attendance management. However, it also highlights the challenges related to system robustness, data security, and integration with existing infrastructures. Building on these advancements, the proposed attendance management system seeks to further enhance the reliability, scalability, and user experience of face recognition- based solutions, addressing both technical and practical issues identified in earlier works.

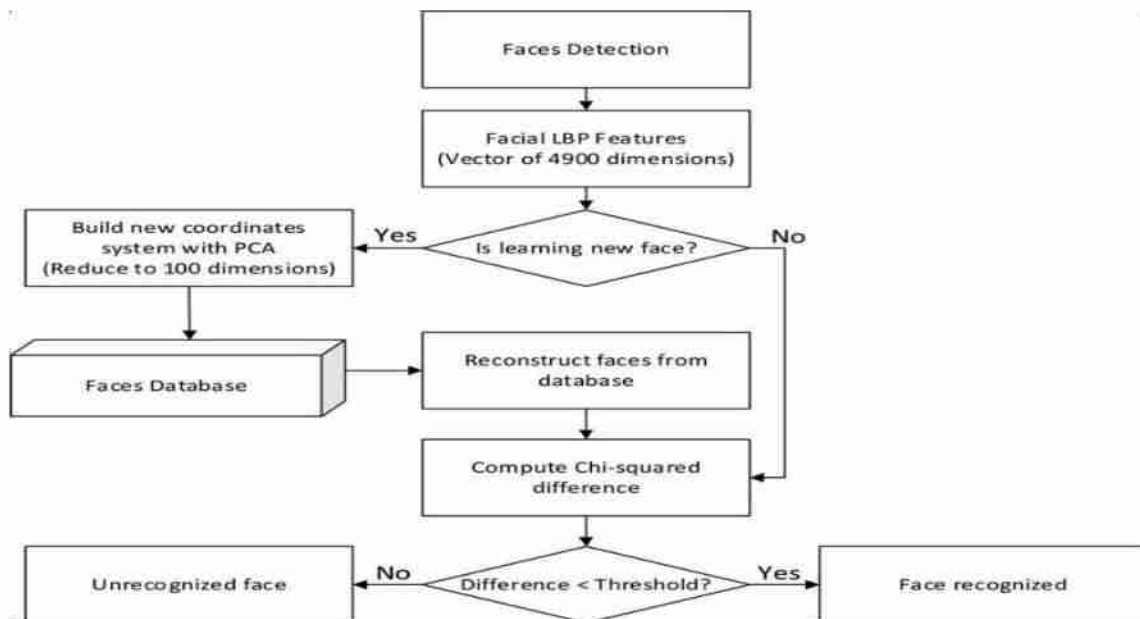
2.2 Current models like Symptom Checker and Existing Models, Techniques, or Methodologies: The combination of advanced face recognition models, real-time detection techniques, security measures, and cloud-based solutions offers a robust foundation for developing an efficient and secure automated attendance management system. These models and methodologies have been successfully used in various applications, and adapting them to the context of attendance management will ensure accuracy, scalability, and reliability in the proposed system.

2.3 Gaps or Limitations in Existing Solutions: While face recognition systems for attendance management offer a promising solution, existing models still face several limitations, including issues related to accuracy, privacy, scalability, and integration with other systems. Addressing these gaps will be critical in developing a robust, secure, and efficient attendance management system that meets the needs of diverse environments. Future advancements should focus on improving algorithm accuracy under varying conditions, ensuring stronger data security measures, and optimizing systems for scalability and user inclusivity.

CHAPTER 3

Proposed Methodology

3.1 System Design



1. **User Interface (UI):**

- **Web/Mobile Application:** Staff or admins can log in to view attendance reports.
- **Live Feed UI:** Shows the live camera feed where faces are captured.
- **Report UI:** Generates attendance reports and analytics.
- **Tools:** HTML, CSS, JavaScript (React or Angular).

2. **Face Detection and Recognition Module:**

- **Face Detection:** Captures faces from a live camera feed using **Haar Cascade** or **MTCNN**.
- **Face Recognition:** Uses a model like **FaceNet** or **Dlib** for feature extraction and comparing facial embeddings.
- **Tools:** OpenCV, TensorFlow, PyTorch, or Mediapipe.

3. Database Management:

- **Employee/Student Database:** Stores employee or student data, including facial embeddings for comparison.
- **Attendance Logs:** Stores daily attendance logs with timestamps.
- **Tools:** MySQL, PostgreSQL, MongoDB.

4. Backend (Application Server):

- a. **API Services:** Expose REST APIs for recording attendance and managing user data.
- b. **Business Logic:** Processes data, matches embeddings, and updates attendance.
- c. **Tools:** Flask, Django (Python), Node.js (JavaScript).

5. Attendance Processing:

- a. Recognized faces are logged into the database with timestamps.
- b. Maintains records for absent and late arrivals.

6. Notification System (Optional):

- a. Sends alerts or attendance summaries via email or SMS.
- b. Tools: Twilio API or Email services.

7. Hardware Integration:

- a. **Camera:** Captures images or videos for face detection.
- b. **Edge Devices:** For real-time processing (like a Raspberry Pi or edge AI devices).

3.1.1 Hardware Requirements:

CPU: A modern multi-core processor (e.g., Intel i5) for efficient task handling.

RAM: Minimum of 8 GB RAM for running chatbots and managing session history in real-time.

Internet: Stable internet connection for accessing Groq API and external resources.

3.1.2 Software Requirements:

Operating System

- **Windows / Linux / macOS**

2. Programming Languages

- **Python:** For face recognition and backend.
- **SQL:** For the database.

3. Tools and Libraries

- **Face Recognition:**
 - **OpenCV** (for face detection)
 - **Keras**
 - **Pytorch**
 - **tensorflow**
- **Database:**
 - **MySQL** (to store attendance records)

4. Development Tools

- **IDE:** Visual Studio Code
- **Version Control:** Git and GitHub

CHAPTER 4

Implementation and Result

4.1 Snap Shots of Result:

FIGURE 1 :

- ✓ This is the screen where new employees or students register their details and face data.
- ✓ The system captures the user's name, ID, and face image.
- ✓ The captured face is pre-processed and stored as **face embeddings** in the database for future recognition.



FIGURE 2 :

- ✓ This step shows the system capturing a live feed from the camera.
- ✓ Faces in the live feed are **detected** using OpenCV
- ✓ The detected face is compared with stored face embeddings in the database using a recognition model like **FaceNet**
- ✓ If a match is found, the system proceeds to mark attendance

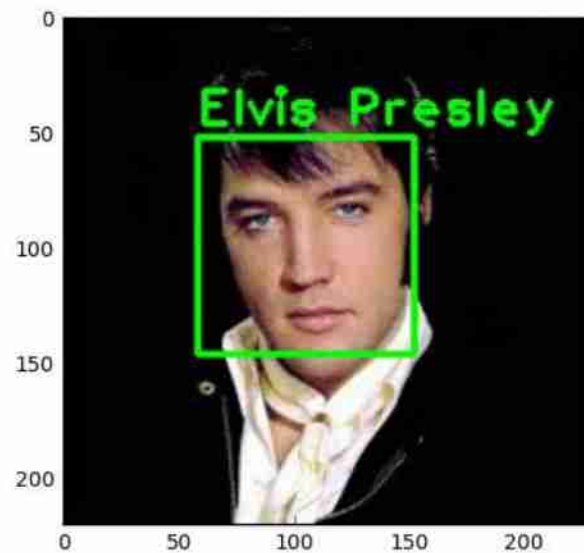


FIGURE 3 :

- ✓ Once the face is recognized, attendance is automatically marked in the system.
- ✓ The system records details like **Name, ID, Date, and Time** of recognition.
- ✓ A confirmation message, like "**Attendance Marked Successfully**", is displayed.

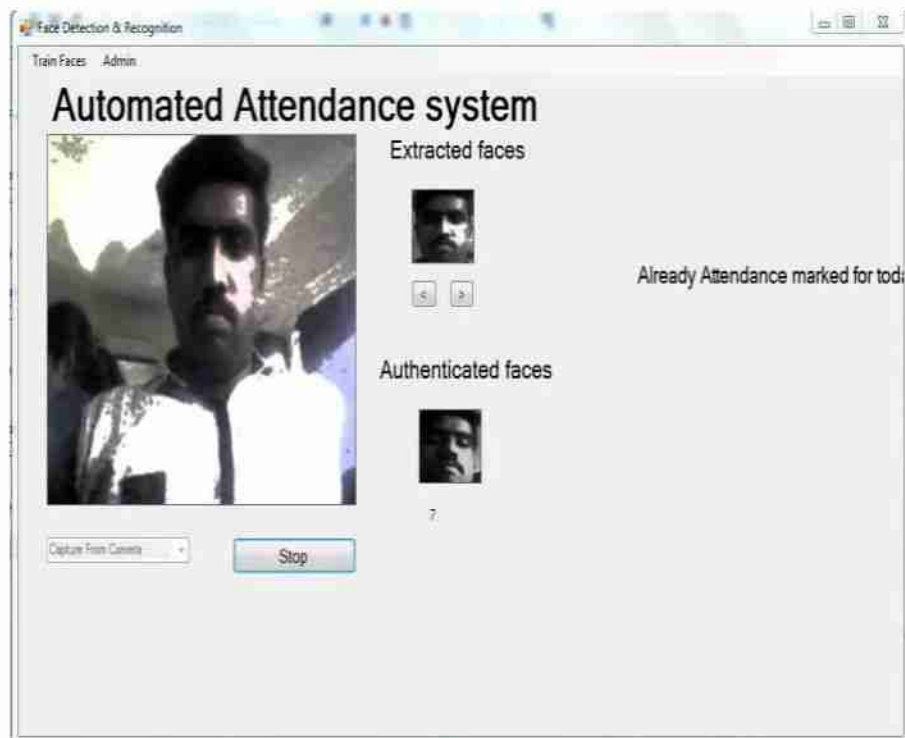
**FIGURE 3 :**

FIGURE 4 :

- ✓ This screen shows the **Attendance Report** generated for a specific day, week, or month.
- ✓ Reports can be viewed, filtered, and exported.
- ✓ Each row in the report shows the **Name, ID, Date, Time,** and Attendance Status (Present/Absent)..



MSOfficeGeek

www.MSOfficeGeek.com

Employee Attendance Sheet (Excel, OpenOffice Calc & Google Sheets)

Year	2021	Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Month	January	Type of Day	W	W	H	W	W	W	W	W	W	H	W	W	W	W	W	W	H	W	W	W	W	W	W	H	W	W	W	W	W	H	
Emp. ID	Employee Name	Month	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun
AS2101	Ashta Pun	January	P	L	H	HD	SL	CL	T	NH	FH	H	ML	EL	P	P	P	P	H	P	P	P	P	P	H	P	P	P	P	P	P	P	H
AS2102	Bijal Pande	January	P	P	H	L	P	P	P	NH	FH	H	P	P	P	P	P	P	H	P	P	P	P	P	H	P	P	P	P	P	P	P	H
AS2103	Chirag Sharma	January	P	P	H	P	P	P	P	NH	FH	H	P	P	P	P	P	P	H	P	HD	P	P	P	H	P	P	P	P	P	P	P	H
AS2104	Divya Soni	January	P	P	H	P	P	HD	P	NH	FH	H	P	P	P	P	CL	P	H	P	P	P	P	P	H	P	P	CL	P	P	P	H	
AS2105	Erum Rastogi	January	P	P	H	P	P	P	P	NH	FH	H	P	P	P	P	P	P	H	P	P	CL	P	P	H	P	P	L	P	SL	P	H	
AS2106	Farhan Patel	January	P	P	H	P	P	P	P	NH	FH	H	P	P	P	P	P	P	H	P	P	P	P	P	H	P	P	P	P	P	P	P	H
AS2107	Geet Sahu	January	P	P	H	P	L	P	P	NH	FH	H	P	P	P	P	P	H	P	P	P	SL	P	H	P	P	P	P	P	P	P	P	H
AS2108	Himesh Surya	January	P	P	H	P	P	P	P	NH	FH	H	P	P	P	P	P	H	P	HD	P	P	P	H	P	P	L	P	P	P	P	P	H
AS2109	Imran Abha	January	P	P	H	P	L	P	P	NH	FH	H	P	P	P	SL	P	H	P	P	P	P	P	H	P	P	P	P	P	P	P	P	H
AS2110	Jitendra Pande	January	P	P	H	P	P	P	P	NH	FH	H	P	P	P	P	P	H	L	P	P	P	L	P	H	L	P	P	P	P	P	P	H
AS2111	Kaifash Rane	January	P	P	H	P	P	P	P	NH	FH	H	P	P	P	P	P	H	P	P	P	P	P	H	P	P	P	P	P	P	P	P	H
AS2112	Luv Patel	January	P	P	H	P	L	P	P	NH	FH	H	P	P	L	P	P	H	P	HD	P	P	P	H	P	P	CL	P	P	P	P	P	H
AS2113	Manoj Bhide	January	P	P	H	P	P	P	P	NH	FH	H	L	P	P	P	P	H	T	T	T	T	T	H	P	P	P	P	P	SL	P	H	
AS2114	Nancy Pastor	January	P	P	H	P	P	P	P	NH	FH	H	P	P	P	P	P	H	P	P	P	P	HD	P	H	ML	ML	ML	ML	ML	ML	H	
AS2115	Omar Shaikh	January	P	P	H	P	P	P	P	NH	FH	H	P	P	P	P	P	H	P	P	P	P	P	H	P	P	P	P	P	P	P	P	H
AS2116	Preetam Chavla	January	P	P	H	P	P	P	P	NH	FH	H	P	P	P	P	P	H	P	P	P	P	P	H	P	HD	P	P	P	P	P	P	H
AS2117	Ram Vihaan	January	P	P	H	P	P	P	P	NH	FH	H	P	P	P	P	P	H	P	P	P	P	P	H	P	P	P	P	P	P	P	P	H
AS2118	Sunil Upadhyay	January	P	P	H	P	P	P	P	NH	FH	H	P	P	P	P	P	H	P	P	P	P	P	H	P	P	P	P	P	P	P	P	H
AS2119	Tirth Chobe	January	P	P	H	P	P	P	P	NH	FH	H	P	P	P	P	P	H	P	P	P	P	P	H	P	P	P	P	P	P	P	P	H

4.2 GitHub Link for Code:

<https://github.com/Nisha-Jayachandran/Aicte-project.git>

CHAPTER 5

Discussion and Conclusion

5.1 Future Work:

1. Integration of Advanced AI Models

- **Improvement of Accuracy:** Use more advanced deep learning models (e.g., Vision Transformers, improved CNNs) to enhance recognition accuracy, especially in challenging conditions like low light or partial occlusions.
- **Real-Time Processing:** Optimize models for real-time performance, reducing latency in attendance marking.
- **Emotion and Expression Handling:** Include capabilities to handle varied facial expressions that could otherwise hinder recognition.

2. Hardware and Sensor Enhancements

- **3D Face Recognition:** Use 3D cameras and LiDAR technology for more robust recognition that is less affected by lighting and pose variations.
- **Edge Computing:** Deploy AI models on edge devices like IoT-enabled cameras for decentralized and efficient recognition.
- **Wearable Devices:** Develop mobile or wearable attendance systems that integrate face recognition.

3. Multi-Modal Biometrics

- **Fusion with Other Biometrics:** Combine face recognition with fingerprints, voice recognition, or iris scanning for increased accuracy and reliability.
- **Behavioral Biometrics:** Incorporate behavioral patterns like gait recognition to complement face data.

4. Cloud-Based and Distributed Systems

- **Scalable Cloud Infrastructure:** Design cloud-based solutions for scalability to handle large institutions and enterprises.
- **Hybrid System:** Combine edge and cloud processing to balance speed and computational power.
- **Blockchain Integration:** Use blockchain to ensure secure, tamper-proof attendance records.

5. Anti-Spoofing and Security Improvements

- **Liveness Detection:** Enhance systems to detect spoofing attempts using photos, videos, or masks through liveness detection techniques.
- **Privacy-Preserving Face Recognition:** Implement federated learning or homomorphic encryption to preserve privacy while training models.
- **Secure Data Transmission:** Use encrypted communication protocols to prevent unauthorized access to attendance data.

5.2 Conclusion:

The **Face Recognition-Based Attendance Management System** offers an innovative and efficient solution to the traditional attendance-taking process. By leveraging advanced facial recognition technology, the system automates attendance recording, ensuring accuracy, reducing human intervention, and saving time. This approach eliminates issues such as proxy attendance, manual errors, and delays associated with conventional methods.

In conclusion, the project showcases how emerging technologies can revolutionize mundane tasks, enhance operational efficiency, and provide a robust solution to attendance management challenges. With further advancements and refinements, the system holds significant potential for widespread adoption across industries and educational institutions.

REFERENCES

- [1]. Laranjo, L., et al. (2018). Conversational agents in healthcare: A systematic review. *Journal of the American Medical Association*, 320(10), 1035-1047. A comprehensive review of conversational agents in healthcare, covering their uses and effectiveness.
- [2]. Huang, Y., & Ngu, A. H. H. (2017). Medical chatbot systems: A review of recent advances. *Healthcare Informatics Research*, 23(4), 331-337. This paper reviews the advancements in medical chatbot systems and their applications in healthcare