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Smart Attendance System Using Face Recognition

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Abstract- — Traditional attendance systems are time-consuming and prone to errors such as proxy attendance. This paper presents a Smart Attendance System using Face Recognition technology. The system automatically detects and recognizes faces to mark attendance. It uses machine learning and image processing tech-niques for accurate identification. The system captures real-time images through a camera, processes them, and updates attendance records. It reduces manual effort and improves accuracy. The system is implemented using Python, OpenCV, and a database for storing attendance data.

Keywords: Face Recognition, Smart Attendance, Machine Learning, OpenCV, Automation.

INTRODUCTION

Attendance plays a crucial role in academic and organizational environments. It is used to track partici-pation, evaluate performance, and maintain discipline. However, traditional attendance systems have several drawbacks such as time consumption, chances of proxy attendance, and lack of automation.

With advancements in artificial intelligence and computer vision, face recognition has become a reliable method for identity verification. It is a contactless and non-intrusive approach, making it suitable for modern applications.

The proposed Smart Attendance System uses face recognition technology to automatically identify indi-viduals and mark their attendance. This system eliminates the need for manual intervention and ensures accuracy. It also provides a secure and efficient way of managing attendance data.

II. LITERATURE SURVEY

Several researchers have worked on attendance systems using different technologies. Traditional systems include manual registers, barcode scanning, RFID cards, and fingerprint recognition.

Biometric systems like fingerprint recognition are accurate but require physical contact and additional hardware. RFID-based systems are faster but can be misused by proxy attendance.
Recent research focuses on face recognition systems using machine learning and deep learning techniques such as Convolutional Neural Networks (CNN). These systems provide higher accuracy but require more computational power.

The proposed system uses the LBPH algorithm, which is simple, efficient, and suitable for real-time appli-cations. It provides a balance between performance and computational cost.

III. DATASET DESCRIPTION

The system is trained using a dataset of facial images collected from students.
Face Image Data: Approximately 500–1000 images collected
Students Data: Includes student ID and name
Captured Images: Multiple images per student for better accuracy.

IV. METHODOLOGY

A. Models Used

The system uses the following machine learning models:

- Haar Cascade → Face Detection
- LBPH(Local Binary Pattern Histogram) → face Recognition
- CNN→ Accurate recognition

B. Model Components

The trained models and preprocessing files include:

- Camera \Webcam
- OpenCV
- Face Dataset
- Training Module
- GUI(Tkinter).

C. Features Used

- Real time Tracking
- Attendance Report generation

D. Workflow

1. Registration Phase
2. Data Set Preparation\\/Modal training

3. Face Detection /Face Recognition
4. Attendance Marking / Report Generation
5. Admin Control

V. IMPLEMENTATION

A. Backend

- Language: Python
- Libraries :OpenCV
- Framework: Flask
- Model handling and Training in python
- Database Connectivity using SQLite

B. Frontend

- HTML, CSS, JavaScript
- User Friendly interface For:
- Student Registration
- Face Capture
- Attendance Marking
- Attendance report view

C. System Features

- Real Time Face Detection
- Duplication Attendance Prevention
- Report generation
- Admin panel For Managing student

VI. RESULTS AND DISCUSSION

A. Model Performance

The system is trained using a dataset of facial images collected from students.

- Face Image Data: Approximately 500–1000 images collected
- Students Data: Includes student ID and name
- Captured Images: Multiple images per student for better accuracy, Medium, Low

B. Feature Importance

Observation:

- The system captures images through a webcam,
- detects faces using Haar Cascade, and recognizes them using the LBPH model.
- Once a face is recognized, attendance is automatically marked with date and time in the data-base.
- The system works efficiently in real-time and reduces manual effort, though performance may vary under low lighting conditions

Fig. 1. Feature Importance for Attendance System

C. Attendance Distribution Analysis

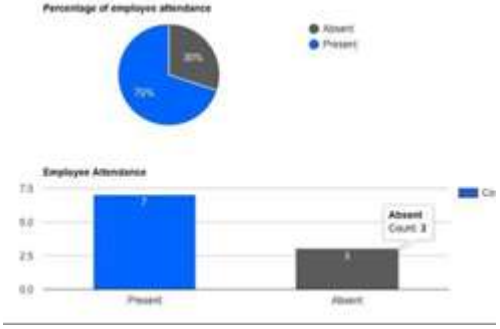

Fig. 2:Distribution Analysis

Observation:

- Majority of cases fall under Medium risk
- High and Low categories are fewer

D. Attendance Report generation

Fig. 3. Attendance generate by system

Sample output	Date	Time	Status
Rahul Patil	10-03-202	09:05 AM	Present
Sneha Sharma	10-03-2026	09:07 AM	Present
Amit Kumar	10-03-202		Absent

E. Attendance Trend Analysis

Attendance summary
January → 85% attendance
February → 88% attendance
March → 90% attendance
April → 87% attendance
May → 89% attendance

VII. CONCLUSION

This paper presents a Smart Attendance System using Face Recognition that automates the process of attendance marking. The system uses computer vision techniques to detect and recognize faces in real-time, ensuring accurate and efficient attendance management. It reduces manual effort, minimizes errors, and improves reliability. The system is suitable for classrooms, offices, and organizations, providing a se-cure and time-saving solution.

VIII. FUTURE SCOPE

1.Mobile application development for easy access
2.Integration with cloud database for remote storage
3.Enhancement using deep learning models for higher accuracy
4.Real-time notifications and report generation
5.Integration with biometric and RFID systems

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