Attendance Management System using Face Recognition

A Project Report

Submitted in partial fulfillment of the requirements

of

AICTE Internship on AI: Transformative Learning
with
TechSaksham – A joint CSR initiative of Microsoft & SAP

By

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ABSTRACT

This project report focuses on the development of an Attendance Management System using Face Recognition. The proposed system addresses the inefficiencies of traditional attendance systems prone to manual errors and proxy attendance.

The system leverages Python, OpenCV, Dlib, MySQL, and React.js to create a secure and reliable attendance tracking platform. The face recognition system ensures real-time attendance without the need for specialized hardware. A local Wi-Fi network supports the device's connectivity, enabling offline operations.

Key results demonstrate reduced manual workload, enhanced accuracy, and proxy prevention. Future work includes expanding the system’s scalability and cloud synchronization capabilities.

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CHAPTER 1

Introduction

1.1Problem Statement:

Describe the problem being addressed. Why is this problem significant?

Ans - Traditional attendance systems are inefficient, prone to manual errors, and susceptible to proxy attendance. This project aims to develop a reliable and cost-effective attendance management system using face recognition to solve these issues.

1.2Motivation:

Why was this project chosen? What are the potential applications and the impact?

Ans - The motivation behind this project is to build a system that automates the attendance process, ensuring reliability and security while eliminating the need for expensive hardware

Objective:

- Develop a face recognition-based attendance system.
- Ensure real-time and accurate attendance marking.
- Minimize manual intervention and associated errors.
- Enable offline operation through local Wi-Fi connectivity.

Scope of the Project:

- **Included:** Face detection and recognition, data management, and real-time attendance updates.
- **Excluded:** Advanced cloud-based storage and multi-campus synchronization (future consideration).

CHAPTER 2

Literature Survey

Facial recognition has been a research-intensive area due to its significant real-world applications. Over the years, various technologies and methodologies have been developed for face detection and recognition. Prominent approaches include traditional computer vision techniques and modern deep learning-based solutions.

Existing Systems Review

1. **Traditional Attendance Systems:**
   Most educational institutions still rely on manual or RFID-based attendance systems. These methods are prone to errors, manipulation, and proxy attendance.

2. **Biometric Attendance Systems:**
   Biometric systems like fingerprint or retina scanners are common. However, they are costly and often require specialized hardware, making them less scalable for large institutions.

3. **Face Recognition Systems:**
   Facial recognition systems have emerged as a more reliable solution. They utilize computer vision algorithms to detect, recognize, and authenticate users based on their facial features.

Technological Background

- **FaceNet: Utilized for face embeddings.**
- **OpenCV & Dlib: Popular libraries for facial detection and recognition.**
- **MySQL: A robust database system for storing attendance records.**

Identified Gaps

- **Dependency on cloud-based storage.**
- **High implementation costs.**
- **Inconsistent data synchronization.**

Our system addresses these challenges by using open-source tools, allowing offline operations, and reducing costs through mobile-based implementation.

CHAPTER 3

Proposed Methodology

System Design Overview

Our system architecture consists of three key components:

1. **Data Collection Module: Captures facial images using a mobile device's camera.**
2. **Processing Module: Extracts features from facial data using OpenCV and Dlib.**
3. **Database Management Module: Stores and manages attendance records in MySQL.**

Workflow Steps

1. **Face Capture: Mobile devices capture images of students' faces.**
2. **Face Recognition: Using face-matching algorithms, faces are compared with the database.**
3. **Attendance Marking: If a face is matched, attendance is marked automatically.**
4. **Data Storage: Attendance records are securely stored in the MySQL database.**

Requirement Specifications

Hardware Requirements:

- **Camera-enabled mobile device**
- **Local Wi-Fi router**

Software Requirements:

- **Programming Languages: Python, JavaScript**
- **Libraries/Tools: OpenCV, Dlib, React.js, MySQL, Node.js**

CHAPTER 4

Implementation and Result

The implementation of the Attendance Management System involved the following key steps:

Modules Implemented:

1. **Frontend Development:**
   - **Framework: React.js was used for building the user interface.**
   - **Features: User authentication, attendance dashboard, and live attendance logs.**
2. **Backend Development:**
   - **Framework: Node.js was used for API creation and server management.**
   - **Database Integration: MySQL for storing attendance records securely.**
3. **Face Recognition Engine:**
   - **Libraries Used: OpenCV and Dlib for facial detection and recognition.**
   - **Algorithm Details:**
     - **Face encoding and matching using pre-trained models.**

Screenshots and Descriptions

1. **Login Screen:**

   "This screen allows users to log in using facial recognition, ensuring secure access."

   (Insert Screenshot: Login Screen)
2. **Attendance Dashboard:**

   "The dashboard shows the list of students marked as present, along

with timestamps."

(Insert Screenshot: Attendance Dashboard)

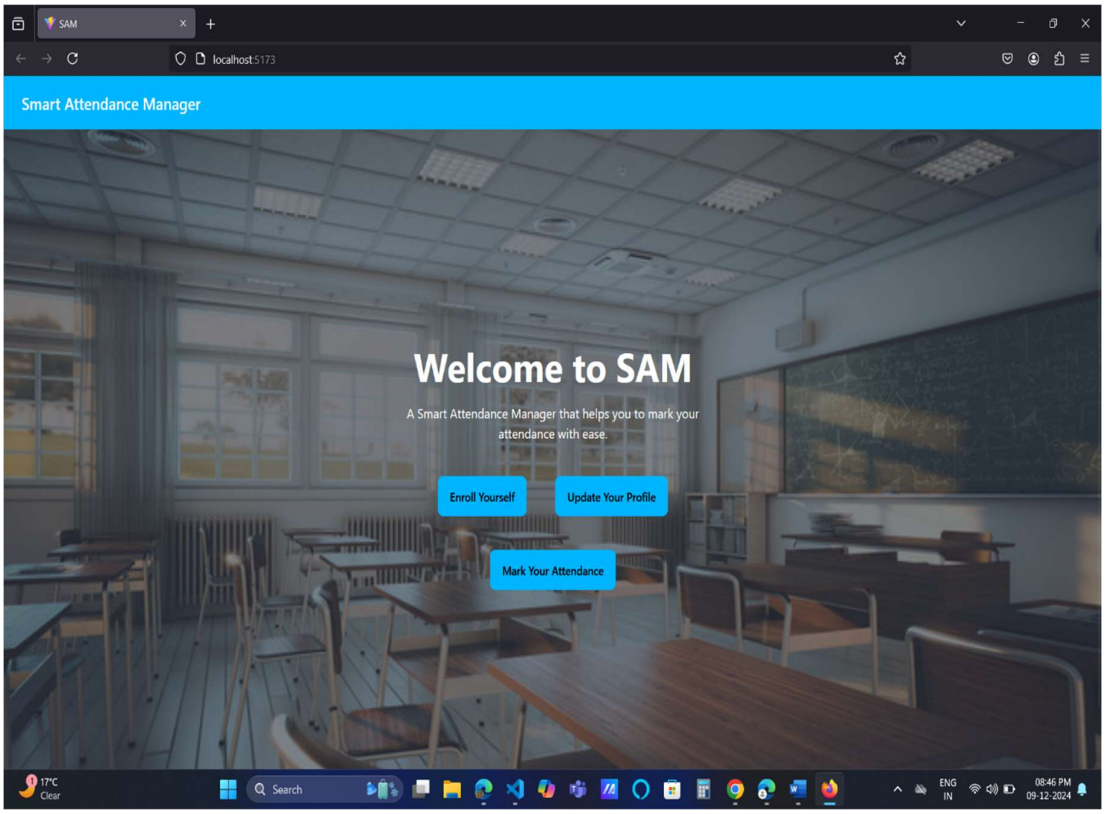
3. **Attendance Logs:**

   "Logs provide a comprehensive view of past attendance records."

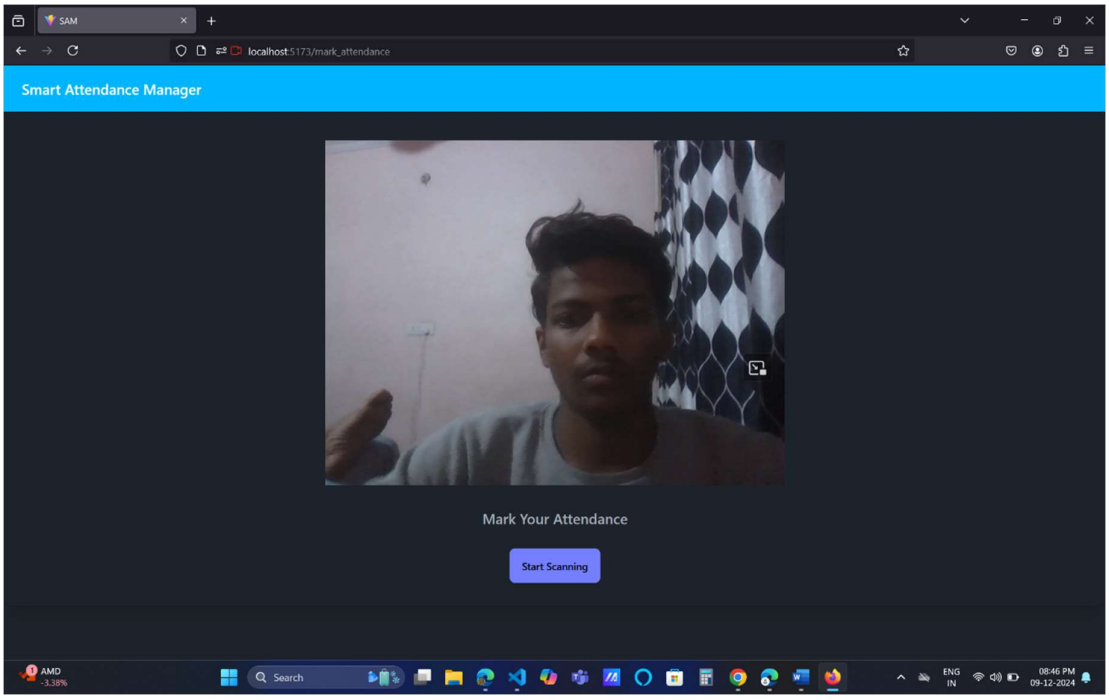
   (Insert Screenshot: Attendance Logs)

Screenshot of working project and code

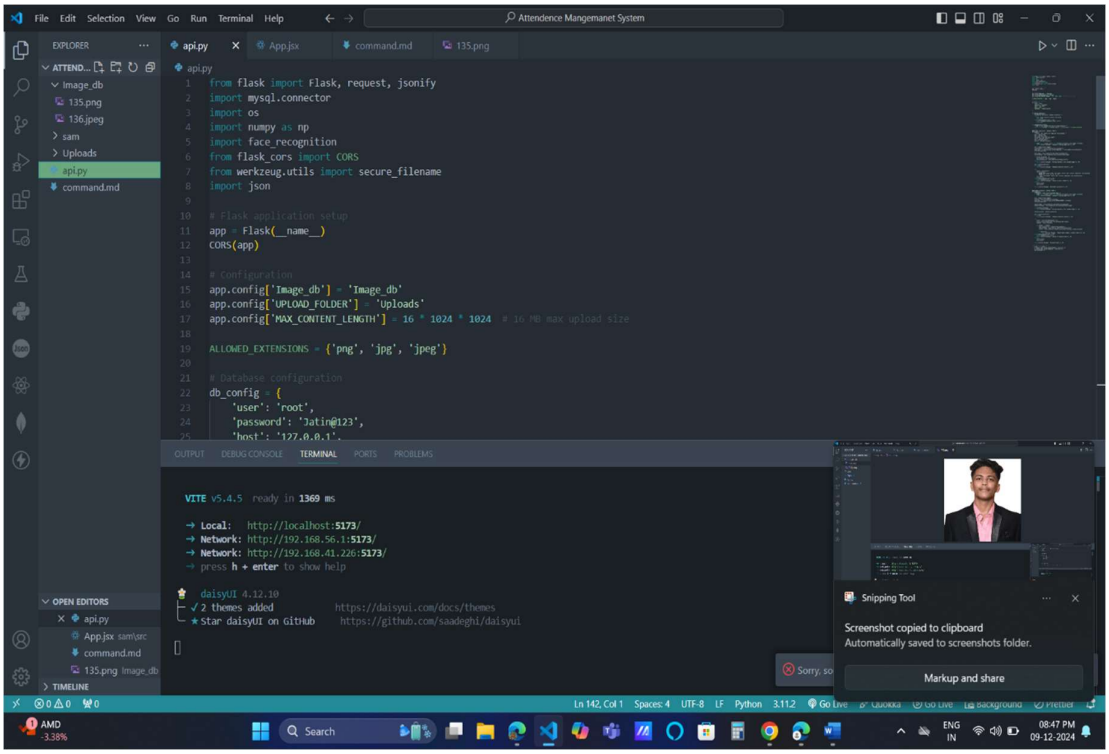
HOME PAGE -



Attendance marking



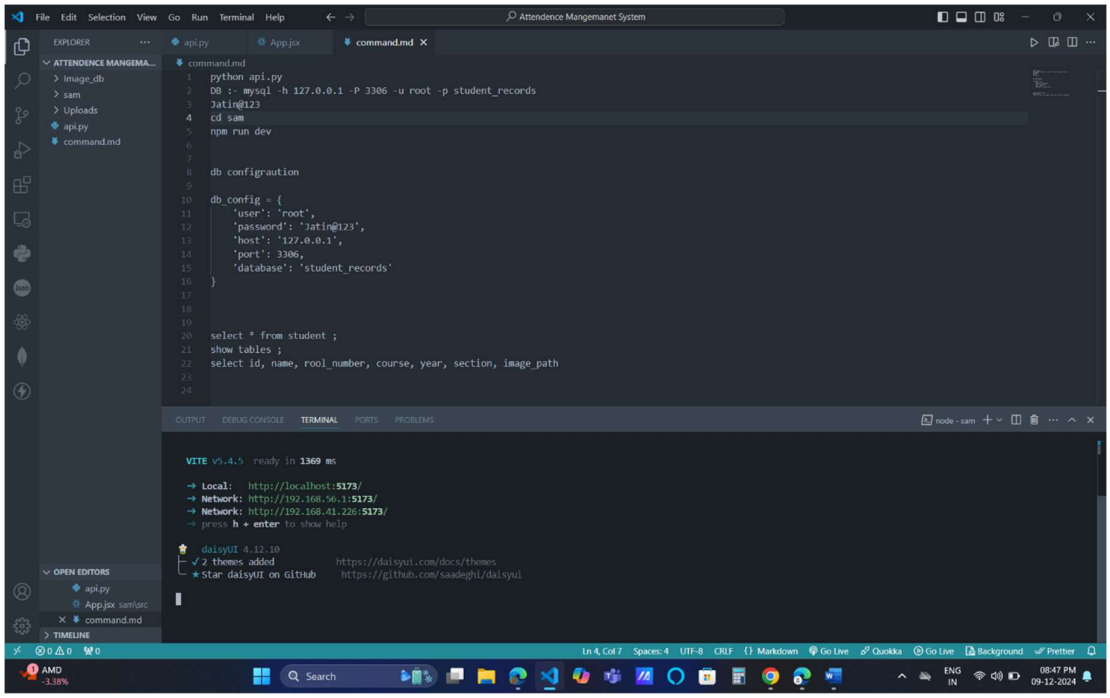
Code Of Python (Api.py)

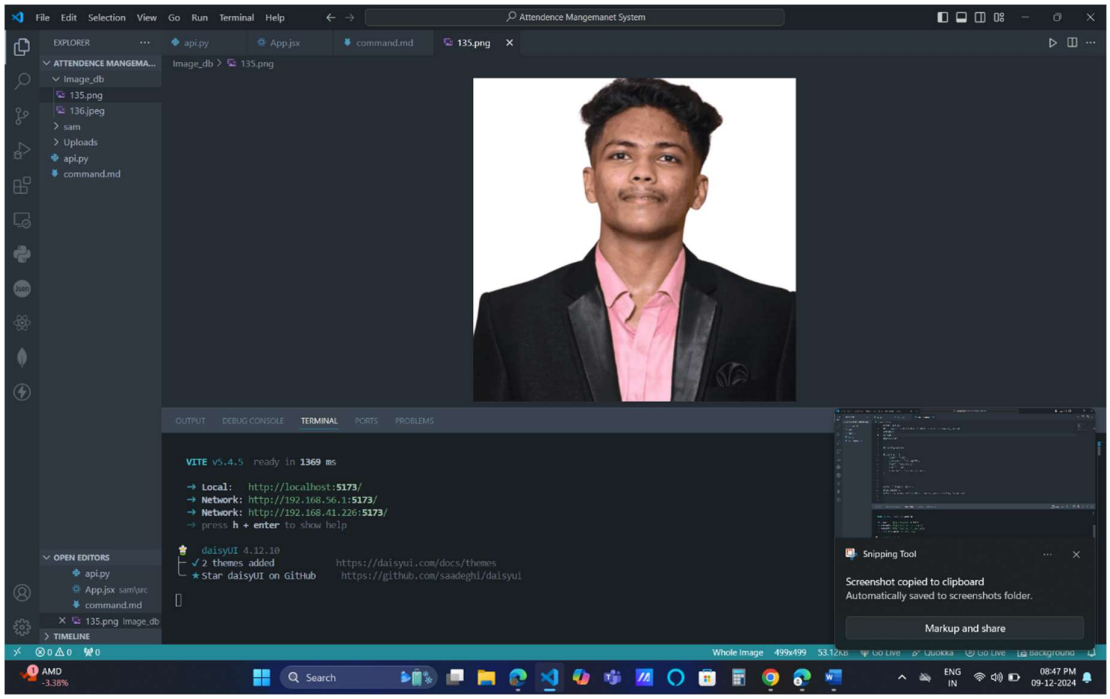


.ENV (PROCESS)

Credentials and commands

For Run project

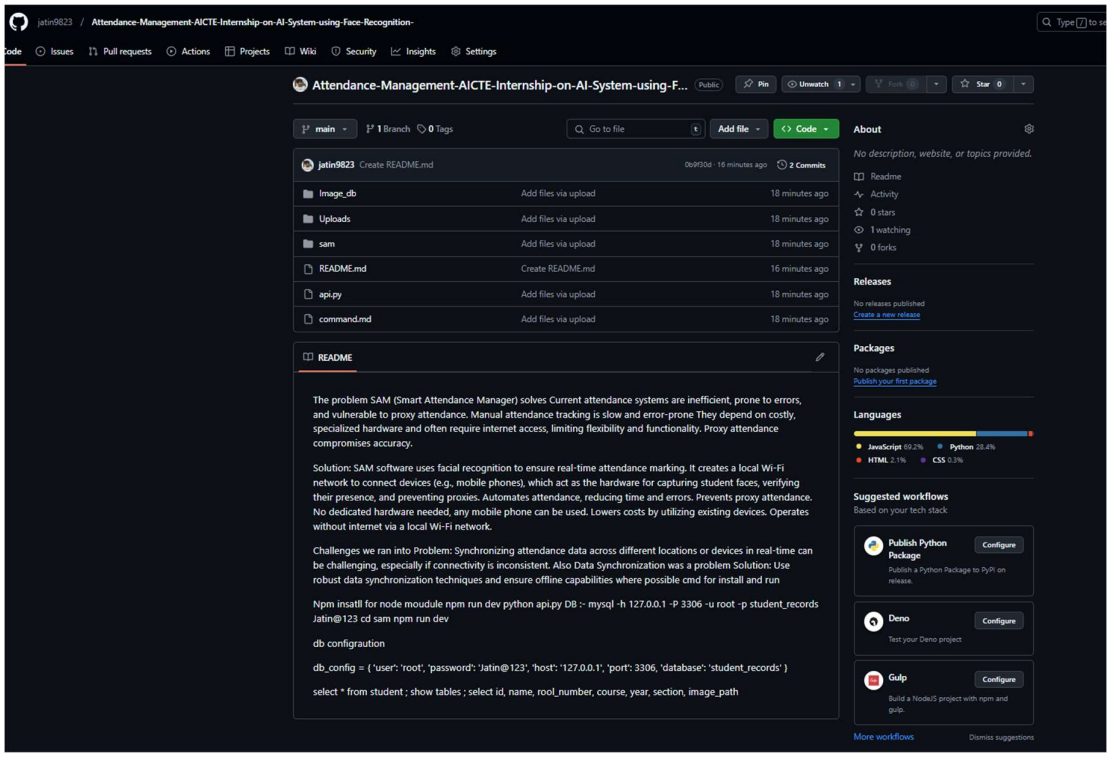




GitHub Link for Code:

https://github.com/jatin9823/Attendance-Management-AICTE-Internship-on-AI-System-using-Face-Recognition-

GIT HUB Repository screen shot



CHAPTER 5

Discussion and Conclusion

The project successfully developed a scalable and efficient Attendance Management System using Face Recognition. This system automates the attendance process while ensuring a high level of accuracy and security.

Challenges We Faced

1. **Data Synchronization:**
    - **Synchronizing attendance records across multiple devices was initially challenging due to offline functionality.**
    - **Solution: We used robust synchronization techniques and enabled offline data storage.**
2. **Face Recognition Accuracy:**
    - **Inconsistent lighting and facial angles impacted recognition accuracy.**
    - **Solution: We implemented enhanced image pre-processing and used data augmentation to improve model performance.**
3. **Real-time Attendance Tracking:**
    - **Real-time recognition required optimizing server response times.**
    - **Solution: We optimized the backend API and reduced database query times.**

Future Work

- **Cloud Integration: Implementing cloud-based storage for enhanced data accessibility.**
- **Scalability: Expanding the system to support multi-campus attendance management.**

- **Advanced AI Models: Incorporating more advanced models such as CNNs for better recognition accuracy.**

Conclusion

The Attendance Management System using Face Recognition has demonstrated significant improvements over traditional attendance systems. It has reduced manual errors, eliminated proxy attendance, and minimized operational costs. Its scalable architecture and offline capabilities make it a reliable solution for educational institutions.