Drishti

Team Description:

Name	Roll number	Department	School	Email	Number
Abhimanyu Valsarajan	CB.EN.U4CSE21601	CSE	Amrita school of computing	cb.en.u4cse21601@cb.students.amrita.edu	9605318503
Anantha Krishnan	CB.EN.U4CSE21604	CSE	Amrita school of computing	cb.en.u4cse21604@cb.students.amrita.edu	8056843431
K Harshavardhan Reddy	CB.EN.U4CSE21627	CSE	Amrita school of computing	cb.en.u4cse21627@cb.students.amrita.edu	8610680864
Varun Sankara Narayanan	CB.EN.U4CSE21665	CSE	Amrita school of computing	cb.en.u4cse21665@cb.students.amrita.edu	9922115993

Team Mentor: Neethu MR, Assistant Professor, Department of Computer Science and Engineering

Duration of work: 30 days

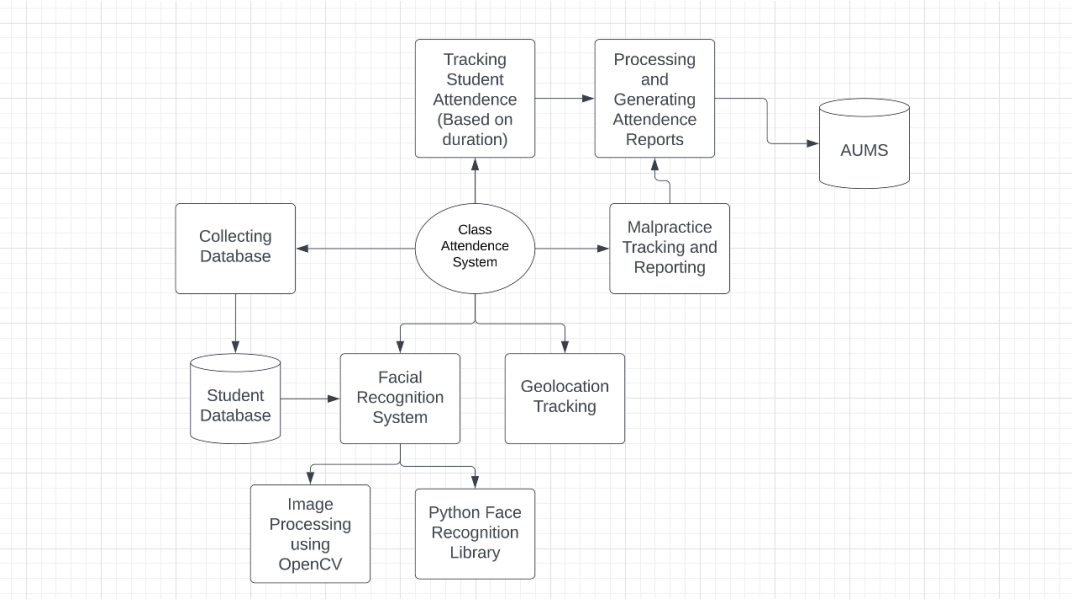
Problem Statement:

To develop an automated classroom attendance system and a mobile application for attendance management

Objectives:

1. Develop a face recognition algorithm.
2. Setup system of cameras in classrooms to detect students, entering and leaving the classroom.
3. Re-enforcing the proposed method with further functionality.
4. Building an application with separate interfaces for students and faculties to track attendance.

Architecture:



Novelty:

1. Implementation of face recognition algorithm to track attendance in a classroom.
2. Will reduce discrepancies and effort required from faculty to manually take and input attendance.

Deliverables:

1. System to keep track of the duration a student spends in each lecture.
2. Update the attendance to AUMS implicitly along with CSV report.
3. Application to request, update attendance for classes and update timetable schedules. Different functionality for faculty and students.

SYSTEM DEVELOPMENT

This project focuses on automating the traditional attendance systems also providing an orderly management system.

Introduction:

The goal is to recognise students entering and leaving classrooms and recording the time spent in the class, and reflecting the same in the attendance database. This model is based on face recognition to recognize the people entering and leaving the classroom. The proposed system will reduce human effort required for taking attendance and provide an organized way

to store and update values. The system and application provide a one stop place for attendance.

Motivation:

1. Time saving
   - The proposed solution will be able to keep a track of attendance without taking up lecture time.
2. Reduces Human effort
   - Currently manual intervention of faculty required to enter attendance details.
   - The system will update the attendance and record lecture details (date, hour) on AUMS if server access is given.
3. Reduces malpractices.
   - The concept of giving “proxy attendance” gets redundant.

Literature Review:

Link	Name	Authors	Year
https://link.springer.com/article/10.1007/s11277-020-07224-2	Real Time Automatic Attendance System for Face Recognition Using Face API and OpenCV	Sikandar Khan, Adeel Akram, Nighat Usman	2020
https://ieeexplore.ieee.org/abstract/document/7763360	Student Attendance System in Classroom Using Face Recognition Technique	Samuel Lukas, Aditya Rama Mitra, Ririn Ikana Desanti, Dion Krisnadi	2016
https://www.researchgate.net/profile/Ade-Kurniawan-6/publication/336186559_Automatic_Attendance_System_for_University_Student_Using_Face_Recognition_Based_on_Deep_Learning/links/5d984f55458515c1d39584d7/Automatic-Attendance-System-for-University-Student-Using-Face-Recognition-Based-	Automatic Attendance System for University Student Using Face Recognition Based on Deep Learning	Tata Sutabri, Pamungkur, Ade Kurniawan, and Raymond Erz Saragih	2019

on-Deep-Learning.pdf			
https://ieeexplore.ieee.org/document/9197936	Automated Attendance System Using OpenCV	Naman Gupta, Purushottam Sharma, Vikas Deep, Vinod Kumar Shukla	2020

https://www.neurotechnology.com/verilook-technical-specifications.html (Camera research)

Research Gaps:

1. Obstacles to obstruct facial recognition. (Hands, Hoodies, Caps)

Boundary cases will arise when objects obstruct the field of view to recognize faces. This can be tackled in 2 ways:

a. Have a secondary system to validate a students' attendance.
   - Using geo-location of student's phone and classroom coordinates.
   - Combination of image processing and geo-location to counter possibility of students leaving phone in class.

b. Send alerts to concerned faculty.
   - Situations where students' faces are covered can be identified by the model and alert will be sent to the faculty in the form of a photograph.

2. Facial Angles- 30 degrees Pitch, 60-degree yaw
   - Network of 2-3 cameras that will help to cover all angles and stick to the ideal dimensions.
3. Ambient Light.
   - Inaccurate results by the algorithm in extreme lighting conditions.

Proposed Systems:

1. Modules

a) Populating Database
b) Tracking and Detection of faces
c) Computing the duration of lecture attended based on entries and exits.
d) Update values on application or AUMS

2. Methodology

A. Populating Database
   - Requires one picture of each student.
   - Requires 3 angles.
   - Local partition on database to avoid overlapping of images.

B. Tracking and detection of faces
   - Utilizing python face recognition module.
   - Using CNN to extract 67 unique feature points for everyone.
   - Cameras will be positioned opposite to each other facing the front door.

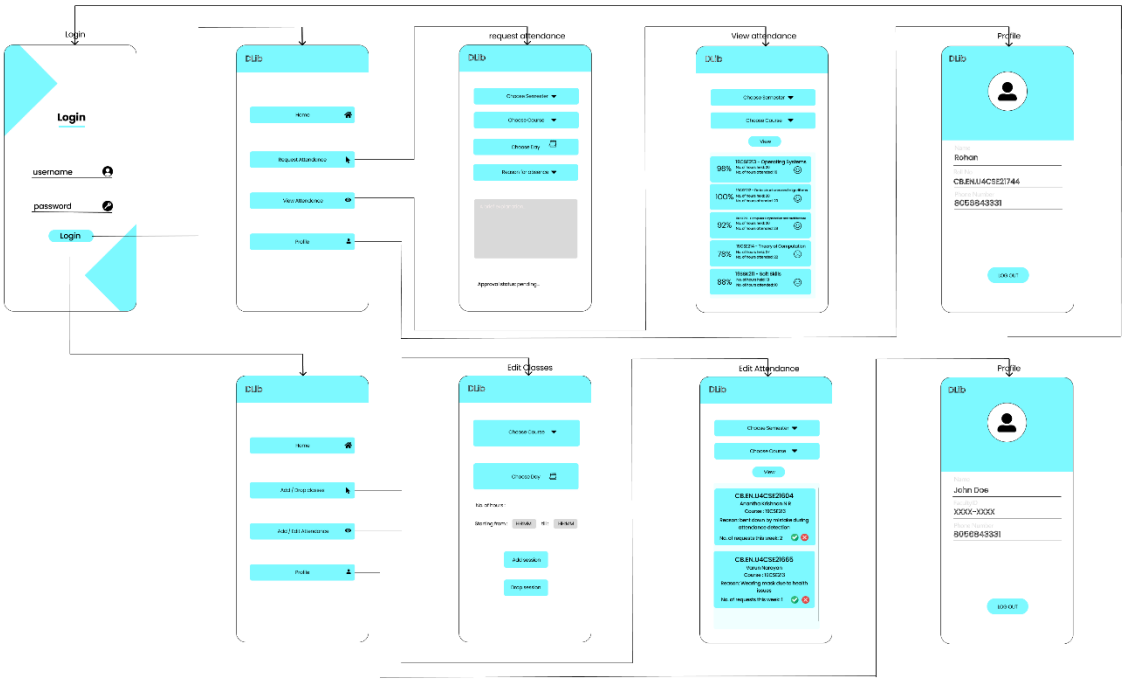
- Threshold line to determine entry/exit.
    - The cameras will be working in unison to calculate the distance as well as the facial recognition.
    - A virtual line to determine when a student enters or leaves a class.
- Duration spent in class to be determined using entry and exit timestamp.

C. Computing Duration
- Utilizes csv file generated in previous module.
- Uses exit and entry timestamp from csv file to compute duration.
- Duration to be stored in temporary memory.
- Attendance only tracked when lecture details set by faculty using the application.

D. Update attendance
- At the end of the lecture, attendance will be updated to main server from local server.

Wireframe for Application for students/faculty:

This application can be integrated as an extension of the existing Amrita Repository application.



a. Faculty Interface
- Faculty can edit individual class attendance in case of special requests. Students will be able to request for attendance which will
- Can schedule/drop lecture hours for the system to track attendance in necessary hours. Duration for a lecture hour can be altered too.
- In case of malpractices during scanning of faces, alert reports will be sent.

b. Student Interface
- View attendance for all classes.

- Send requests to faculty for classes, along with file attachment. (Medical Report)

Camera:

For face recognition, the face posture cannot exceed plus or minus 25 degrees yow and plus or minus 15 degrees of pitch. Considering these factors a few cameras were researched about:

Camera Model and their specifications:

Product 1: Hikvision DS-2CD2043G2-I(U)

Product 2: Hikvision DS-2CD2783G2-IZS

Min. Resolution: 2688 × 1520

Duration and Schedule

1. Basic Face recognition Algorithm: 1 day
2. Wireframe for app: 1 day
3. Exploring other Deep Learning Models: 6 days
4. Procurement of designated camera and other equipment: TBD
5. Fixing Camera position to cover blind spots: 2 days
6. Integration of Camera's and Algorithm: 6 days
7. Building module to store and compute the data from the camera: 3 days
8. Building the application: 5 days
9. Working with AUMS API: 3 days

Expected Results

1. Attendance will be tracked and recorded by the proposed System automatically.
2. One stop application for faculty and students to track attendance.

Conclusion

By the end of the duration, a one stop application and system to measure, track attendance will be built. With minimal cost certain extreme boundary cases can only be dealt by using geolocation or sending alerts.

Future Scope

1. Detecting Full body movements to encounter the above stated ambiguity cases.
2. Detecting Facial features even in case of obstructions such as mask.
3. Countering malpractices in Examinations by using predefined scenarios.
4. Can be implemented in hostels too.