

VIDEO ANALYTICS: AUTOMATED ATTENDANCE SYSTEM

By

Hrushika Patel – 19BCE175

Divya Patel – 19BCE167



**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
Ahmedabad 382481**

VIDEO ANALYTICS: AUTOMATED ATTENDANCE SYSTEM

Report

Submitted in partial fulfillment of the requirements

For the degree of

Bachelor of Technology in Computer Science & Engineering

By

**Divya Patel – 19BCE167
Hrushika Patel – 19BCE175**

Guided By

**Prof. Vipul Chudasama
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**



**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
Ahmedabad 382481**

CERTIFICATE

This is to certify that the Minor Project entitled “VIDEO ANALYTICS: AUTOMATED ATTENDANCE SYSTEM” submitted by Divya Patel(19BCE167) and Hrushi Patel (19BCE175), towards the partial fulfillment of the requirements for the degree of Bachelor of Technology in Computer Science and Engineering of Nirma University is the record of work carried out by him/her under my supervision and guidance. In my opinion, the submitted work has reached a level required for being accepted for examination.

Prof. Vipul Chudasama
Assistant Professor
Computer Science and Engineering Dept.,
Institute of Technology,
Nirma University,
Ahmedabad

Dr. Madhuri Bhavsar,
Professor and HOD,
Computer Science and Engineering Dept.,
Institute of Technology,
Nirma University,
Ahmedabad

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Our thanks and appreciations also go to people who have willingly helped us out with their abilities.

ABSTRACT

Tracking student attendance helps teacher to keep track of student absent and punctuality. Early methods of attendance system are time consuming and not that effective. Therefore, some sort of automation is required to ease the task of teachers and increase the efficiency. We used web cam to capture students face and use a pre trained model to recognize the student and mark his/her attendance. This can be used to mark the time when student entered the class and at what time he/she left. After the basic solution we used a new model for different facial expressions of the user which determines the mood and attentiveness of the person. By this model we can generate the report of attentiveness for each student for every lecture. More to it we can create monthly reports of students related to overall attentiveness, sitting arrangement of students, and activeness. Attendance can mark based on time when students enter the class and the time when they leave. We created GUI for the application. Features of the application are, Separate login pages for Students and Faculties. After Student Login student can check attendance status for different subjects, check how much attentive they are in different lectures, join lecture and after faculty Login, faculty can setup class/lectures, check how many students are attending lectures, check how much attentive students are in their lectures, and Check report for individual student.

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Chapter 1 Introduction

1.1 Brief description about the Project

Using video cameras to mark the attendance of students present in class. Getting video analytics of different parameters from video recording will help the college to resolve many issues such as how much student is paying attention in class, according to their sitting position, how much they talk during class, etc. College can use this proactive surveillance and provide better education to students. By the use of web cam to capture students face and use a pre trained model to recognize the student and mark his/her attendance. It is used to mark the time when student entered the class and at what time he/she left. After getting basic solution application create a new model for different facial expressions of the user which determines the mood and attentiveness of the person. By this model generates the report of attentiveness for each student for every lecture. More to it also creates monthly reports of students related to overall attentiveness, sitting arrangement of students, and activeness. Attendance can be marked based on time when students enter the class and the time when they leave. After successful implementation of this feature, we created GUI for the application. Features of the application are, Separate login pages for Students and Faculties. After Student Login student can check attendance status for different subjects, check how much attentive they are in different lectures, join lecture and after faculty Login, faculty can setup class/lectures, check how many students are attending lectures, check how much attentive students are in their lectures, and Check report for individual student.

1.2 Objectives

Use web cam to capture students face and use a pre trained model to recognize the student's facial expression for marking attendance and attentiveness of the student. After analysis of the expression and attendance generate attentiveness report of the student for each subject. And use attentiveness report of all the students for the particular subject to generate overall report of the subject for teacher. To track students' attendance, the automatic attendance system was created. The teachers and students each receive a unique login and password that may be used to mark and record daily attendance in one place.

With a student attendance system, which is an automated method of not only recording attendance but also identifying significant patterns to track student performance relative to key performance indicators and contribute to student safety, valuable class time can be preserved.

1.3 Problem Statement

Tracking students' attendance helps teacher to keep track of student's absent and punctuality. Early methods of attendance system are time consuming and not that effective. Automation of attendance reduces teacher workload because it needs little to no instructor effort. A strong attendance record improves student outcomes by keeping them up to date with the curriculum, which is directly related to student success. By automating student attendance, a school, college, or university can save up to thousands of rupees per month. If a teacher gives 7 lectures a day and it takes 10 minutes to record attendance for each lecture, then recording attendance would take close to 70 minutes. If the institution has 50 teachers,

the tedious procedure of recording attendance will take 58 hours every day. The 58 hours can easily be condensed to 1 hour, and the significant amount of time saved by the teachers can be put to better use by the students. Given that the attendance system is automated, you can be sure that the data is accurate and devoid of mistakes. Following the marking of the attendance, the recorded information is saved in the student attendance management system, where anyone with access can examine the attendance facts. This function is particularly helpful when looking for a specific student or when seeing trends. Compliance and accreditation organizations like The National Board of Accreditation (NBA) and the National Assessment and Accreditation Council (NAAC) need student attendance data, which can be time-consuming to manually calculate. Everything is made easier and more efficient by using the online attendance management system. Therefore, some sort of automation is required to ease the task of teachers and increase the efficiency.

Chapter 2 Case Study on Different Tools

2.1 Azure Video Analyzer

Built on Azure Media Services and Azure Cognitive Services, Azure Video Indexer is a cloud application that is a part of Azure Applied AI Services. Azure Video Indexer main features are Deep Search, Content creation, Accessibility, Monetization, Content moderation and Recommendation. Azure for video mode gives functionalities of Face detection- Detects and groups faces, appearing in the video, Celebrity identification, Account-based face identification, Optical character recognition, Visual content moderation, Labels identification, shot detection, observed people tracking and Matched person. Azure Video Indexer analyses the video and audio content by running 30+ AI models.

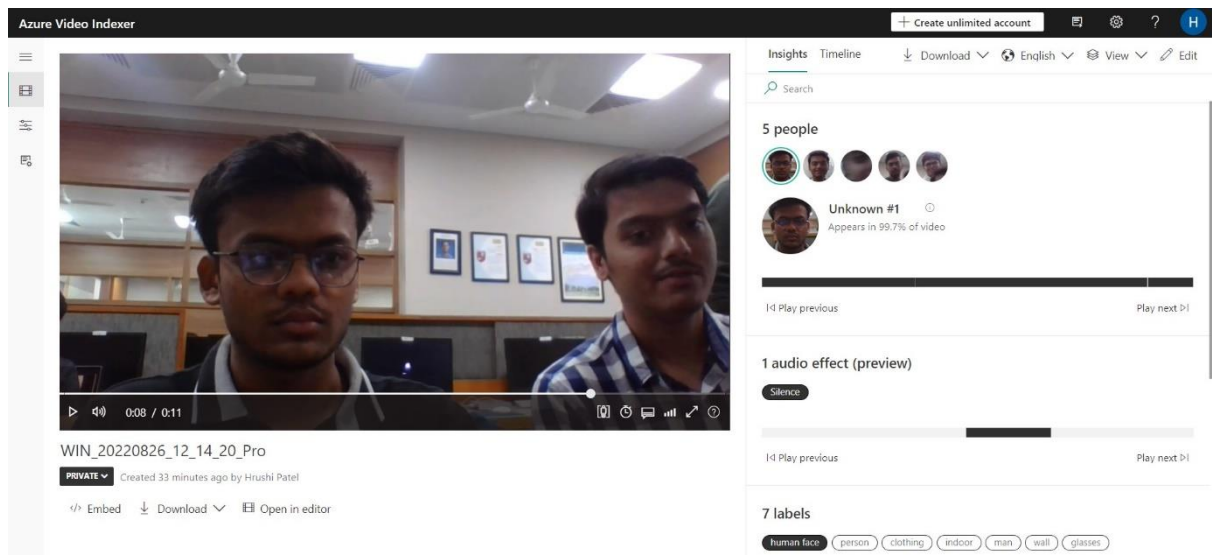


Fig 2.1 Azure Video Analyzer Outcomes

We took the video and analysed the features and outcomes of the Azure video analyser. As a right side in the image, it detects all the detected faces in the video, then it even analyses the audio like the silence period in the video, different labels are generated based on video objects like a human face, person, clothing, indoor, man, wall, glasses, etc. It even facilitates features of providing names to a specific person and detecting total percentage of time person available in window. Automatically identifying temporal and spatial events in videos is the primary objective of video analytics. Usually, these systems perform real-time monitoring in which objects, object attributes, movement patterns, or behaviour related to the monitored environment are detected.

2.2 Open-Source Video Analytics Projects

OpenCV: The Open-Source Computer Vision Library (OpenCV) is the most well-known computer vision library. It includes a complete collection of machine learning algorithms to carry out typical tasks like object identification and tracking, face recognition, and image categorization.

Norfair: A customizable lightweight Python library for real-time 2D object tracking. With just a few lines of code, Norfair enables you to add tracking features to any detector. Norfair

is highly customizable letting users define their own distance functions, it's modular since it can be easily inserted into complex video processing pipelines and it's fast as the Only the detection network limits the pace of inference.

Detectron: The library focuses on object detection, segmentation, and pose estimation. The benefit of Detectron is that it can define an object's boundaries at the pixel level, rather than just drawing bounding boxes around individual objects.

2.3 Deep Face for facial emotion detection and analyses

There is many libraries for facial emotion detection like VGG-Face, ArcFace, Facenet, Dlib, OpenFace, DeepID, DeepFace etc. DeepFace is the name of the most adaptable Python face recognition and facial attribute analysis library. All cutting-edge AI face recognition models are included in the free and open-source DeepFace library, which also handles all facial recognition tasks automatically in the background. You get access to the following functionalities if you use DeepFace for facial recognition:

Face Verification: Comparing two faces to see if they match or not is the task of face verification. Thus, it is usual practise to utilise face verification to compare a candidate's face to that of another. This can be used to confirm that the face on a physical document and the face on an ID are the same.

Face Recognition: Finding a face in an image database is the task at hand. Running face verification repeatedly is necessary for face recognition.

Facial Attribute Analysis: Facial attribute analysis is the process of describing the visual characteristics of face photographs. As a result, variables including age, gender categorization, mood analysis, and race/ethnicity prediction are all extracted using facial attributes analysis. Real-Time.

Face Analysis: With the help of your webcam's live video feed, this tool lets you test facial attribute analysis and face recognition. I'll next go over how to use DeepFace to execute those deep face recognition jobs.

Chapter 3 Methodology

3.1 Tech Stack Used

- Python

3.2 Libraris Used

- OpenCV
- DeepFace
- face_recognition
- PyQT
- SQLite

3.3 Functional Requirements

- Seperate login pages for Students and Faculties.
- Student
 - Login
 - Check attendance status for different subjects
 - Check how much attentive they are in different lectures
 - Join lecture
- Faculty
 - Login
 - Setup class/lectures
 - Check how many students are attending lectures
 - Check how much attentive students are in their lectures
 - Check report for individual student

3.4 Non-Functional Requirements

- Scalable system
- Easily Maintainable
- Secure
- Fault Tolerant
- Reliable and Available
- User friendly interface

3.5 Methodology

- First, we started working on creating model to recognize face using face_recognition.
- Then we integrated it with deepface to identify different facial attributes. At present we are using only facial emotion in our project.
- Created a database model using SQLite 3 to store all the data.
- Created a GUI using PyQT and integrated all the functions.

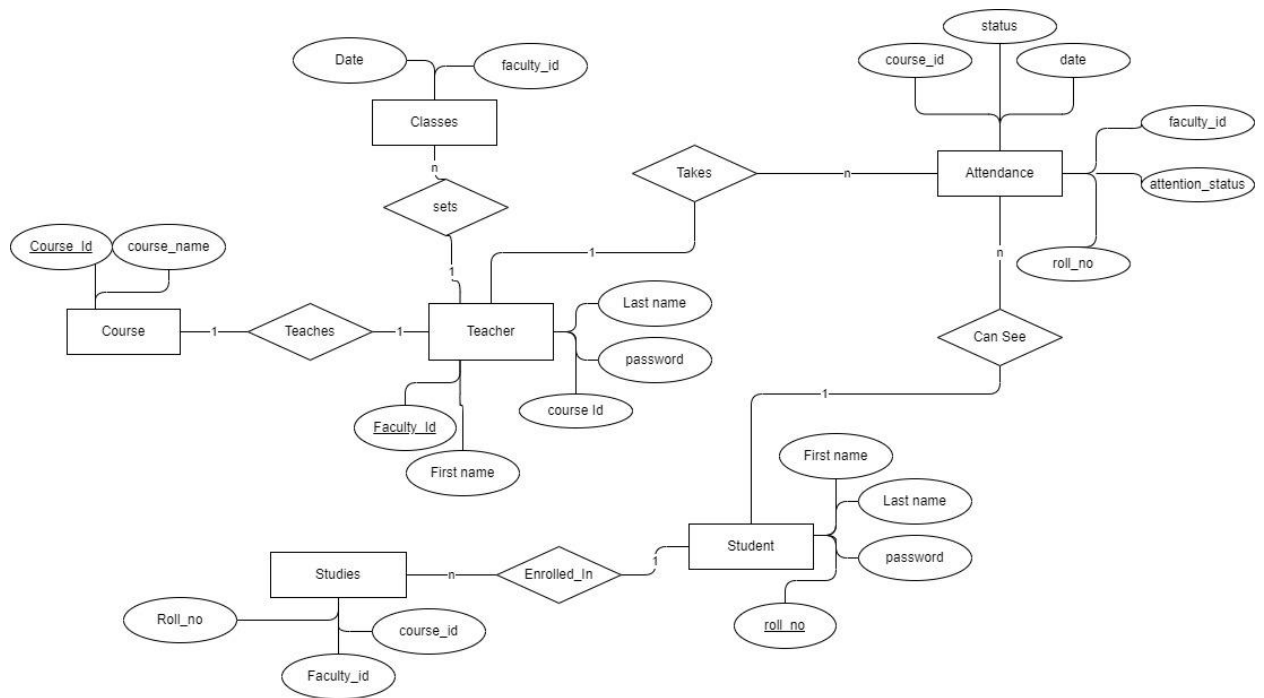


Fig 3.1 ER Diagram of our database

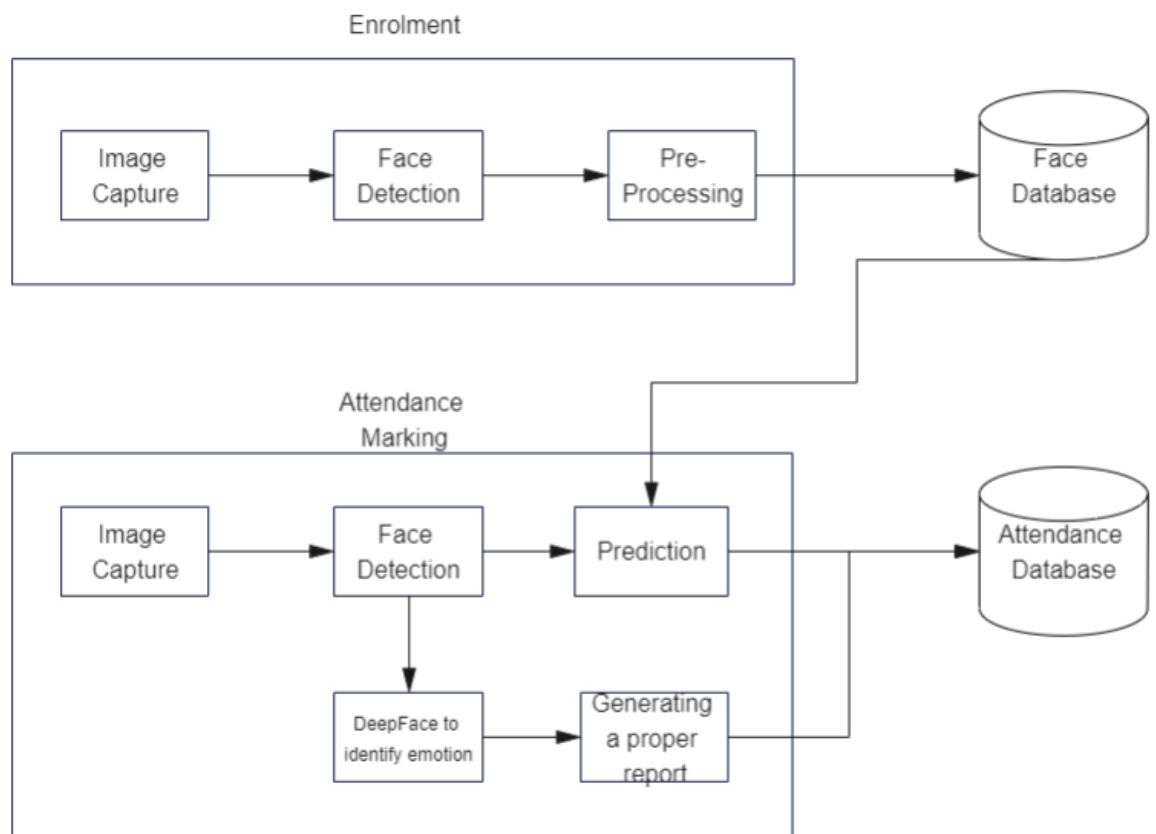


Fig 3.2 Flow Chart of the whole project

Chapter 4 Result Analysis

- ❑ Able to recognize student face using face_recognition library.
- ❑ Using deepface to identify student emotion.
- ❑ Faculty can set class using the functions provided after logging in.
- ❑ Faculty can also check students' attendance.
- ❑ Student can login and can check his/her attendance and also can join class.
- ❑ First web cam will be used to recognize students Roll No in real time, then after recognizing the student, his/her emotion will be recorded for continuous one hour and an attentiveness report will be generated, after that the attendance will be recorded in the database.

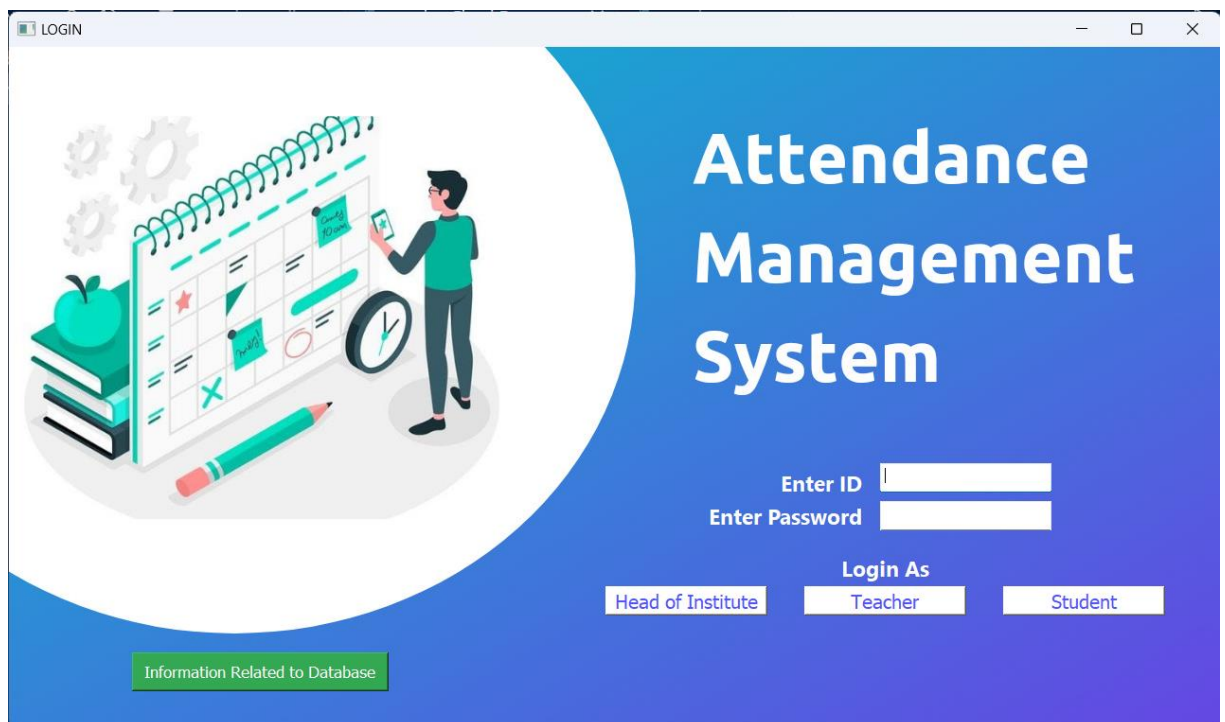


Fig 4.1 Login Screen

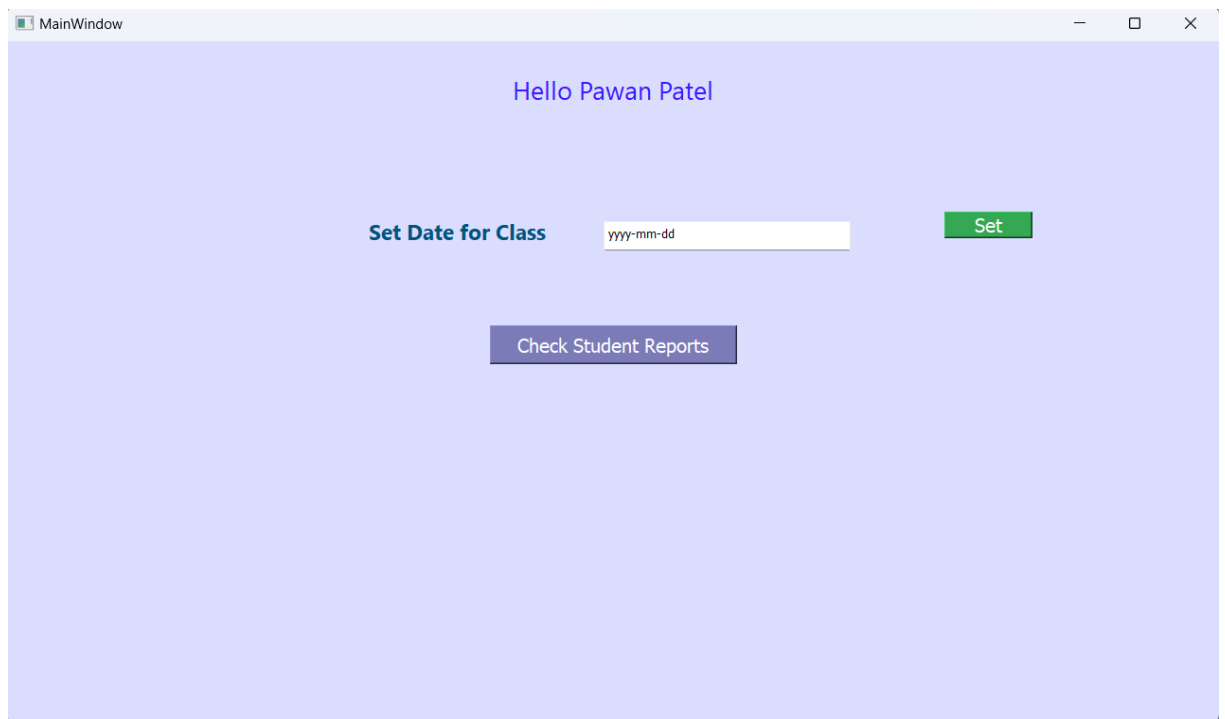


Fig 4.2 Faculty Screen

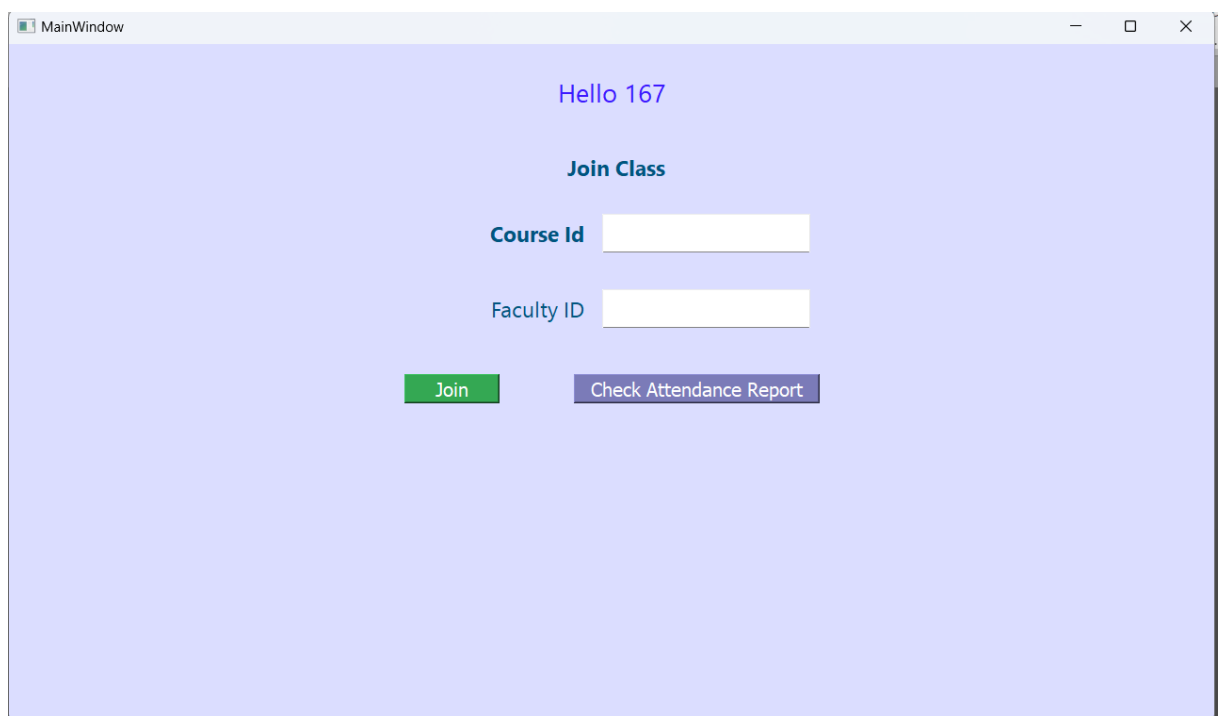


Fig 4.3 Student Screen

Chapter F Summary Conclusion and Future Work

Summary

With this project we are able to identify student with 80-90% accuracy and mark their attendance. It also checks students' attention for the whole period and can help faculties on changing their workflows. To track students' attendance, the automatic attendance system was created. The teachers and students each receive a unique login and password that may be used to mark and record daily attendance in one place. With a student attendance system, which is an automated method of not only recording attendance but also identifying significant patterns to track student performance relative to key performance indicators and contribute to student safety, valuable class time can be preserved.

Conclusion

By this project we can monitor students' attendance easily and efficiently reducing faculties workload. This will help student's to consistently attend classes. Faculty can also see if students are paying attention or not in their class and can change their teaching flow accordingly.

Future Work

- ❑ After the basic solution we can create a new model for different postures of the user which determines the mood and attentiveness of the person.
- ❑ By this model we can generate the report of attentiveness for each student for every lecture.
- ❑ More to it we can create monthly reports of students related to overall attentiveness, sitting arrangement of students, and activeness.
- ❑ Attendance can be marked based on time when students enter the class and the time when they leave.
- ❑ After successful implementation of this feature, we can generate special guidance for each user as per the overall behavior of the user.
- ❑ This can further be improved to use in online test to detect whether student is cheating or not based on their facial characteristics.

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- [2] A. J. Goldstein, L. D. Harmon, and A. B. Lesk, "Identification of Human Faces," in Proc. IEEE Conference on Computer Vision and Pattern Recognition, vol.59, pp 748–760, May 1971.
- [3] M. A. Fischler and R. A. Elschlager, "The Representation and Matching of Pictorial Structures," IEEE Transaction on Computer, vol. C-22, pp.67-92, 1973.
- [4] N. Kar, M K Deb Barma and A Saha, "Study of Implementing Automated Attendance System Using Face Recognition Technique" in International Journal of Computer and Communication Engineering 2012.

Appendices

A) List of Useful Website

- 🔗 <https://viso.ai/computer-vision/deepface/>
- 🔗 https://github.com/ageitgey/face_recognition
- 🔗 <https://towardsdatascience.com/yolo-you-only-look-once-real-time-object-detection-explained-492dc9230006>

B) Additional Materials

- 🔗 <https://pythonpyqt.com/>
- 🔗 <https://www.sqlite.org/index.html>