St. Thomas College of Engineering & Technology
Vellilode, Sivapuram P.O., Mattanur, Kannur District, Kerala
Approved by AICTE New Delhi, Govt. of Kerala and Affiliated to APJ Abdul Kalam Technological University

National Conference on Recent Advancements In Engineering and Technology: RAET'25

STUDENT ENGAGEMENT DETECTION IN E-LEARNING

VIVEK RAJEEV V
ABHINAV K
SWATHI KRISHNA
ANUSREE K
CLARA JOSEPH

PAPER ID: CSE45

OUTLINE

- Introduction
- Objective
- Problem definition
- Proposed System
- Architecture Diagram
- Implementation Details
- Project Outcome
- Conclusion

Introduction

- In this era of online learning, monitoring student engagement has become a major challenge for educators. In traditional classrooms, teachers can gauge attention through body language and facial expressions, but these signals are harder to capture in virtual settings.
- Student engagement is crucial for effective learning, so finding ways to track it accurately in online platforms is important.
- Our project introduces a system that uses computer vision and deep learning to automatically detect student engagement

Objective

- Student Engagement detection aims to encourage the students to stay in-front of the screen in time of online classes
- Enables the teacher to monitor the student’s focus on learning as done in real class.
- It helps to teacher to give reward to the students in the form of attendance.
- It also provides a place for teachers to provide online class link to students Also enables the teachers to evaluate their class based on the engagement level of the students

Problem definition

- In online learning, it is difficult for educators to evaluate student engagement, as signs like facial expression and eye movements are harder to observe.
- This can lead to reduced participation and lower learning outcomes. Current methods of tracking engagement, such as self-reports or quizzes, are often slow and unreliable.

Proposed System

- The proposed system consist of two application one for the student and other for the teacher
- **Faculty Application:** Link to the online class and details of the class can be updated by the teacher in the application. The faculty can view the report after when the online class is over. Live report of the students,presence in front of the camera will be reported to the faculty
- **Student App:** Students can login using their user-id and password in the student app and view the links to the online classes upload by the teacher The app will start monitoring the student from the beginning of the online class. The AI models will make prediction every one second inturn generating the EI score and average of this prediction is taken in 60 seconds and the engagement state for that time will be recorded

Contd.

- EI score calculation

a) EI score for head pose:

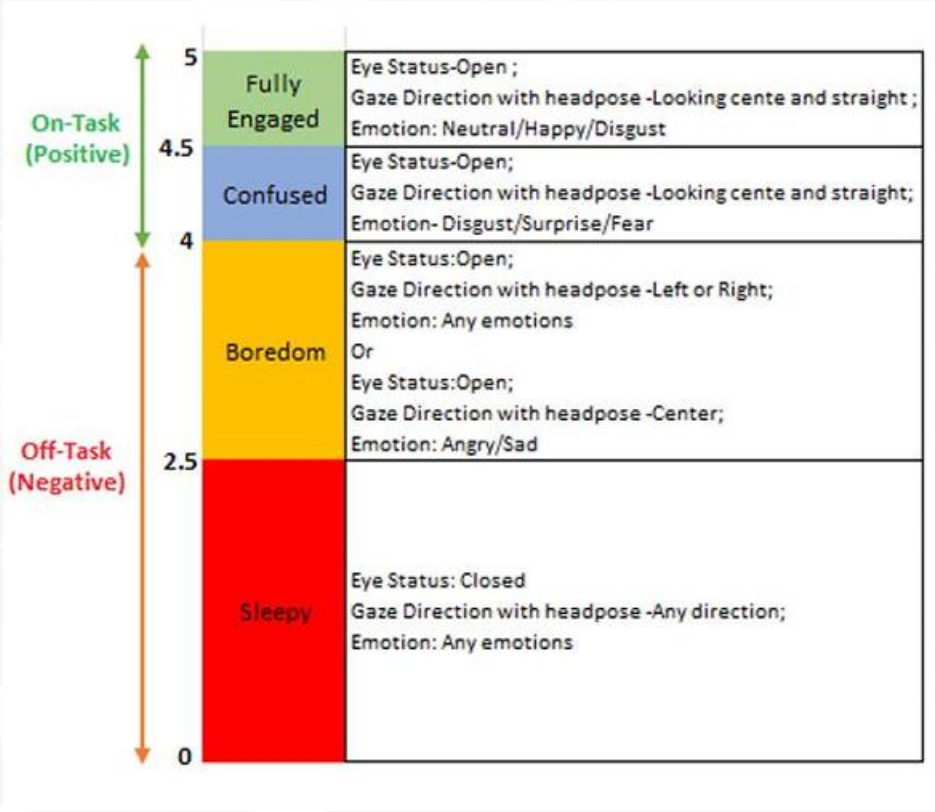
Look Center	Left head pose/Left gaze	Right Head pose/Right Gaze
1	0	0

b) EI score for eye status

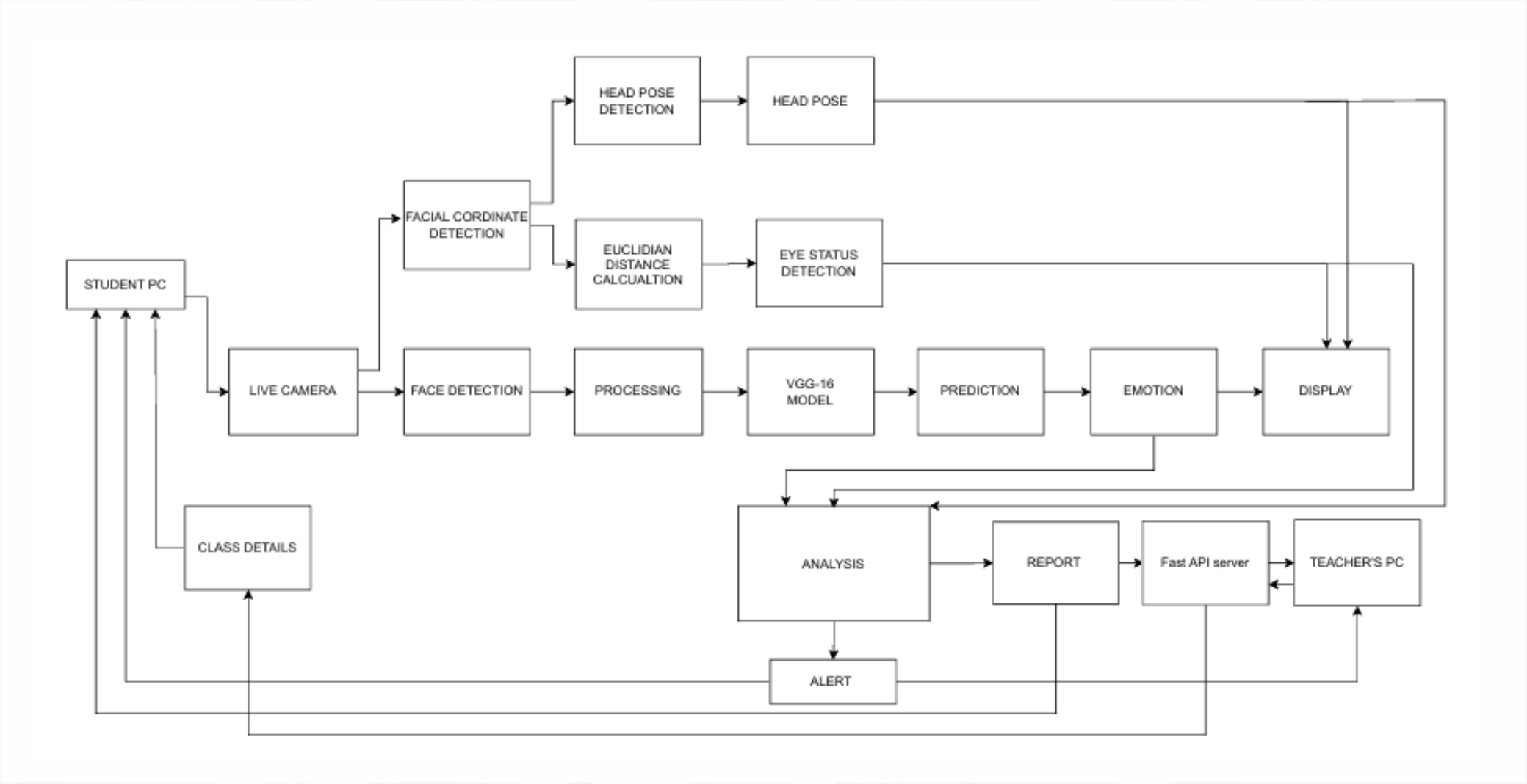
Eye Close	Eye Open
0	2.5

c) EI score for emotion

Emotions	Angry	Sad	Fear	Surprise	Disgust	Happy	Neutral
Weight of Emotions towards Engagement	0.1	0.3	0.5	0.7	0.9	1.1	1.4



Architecture Diagram

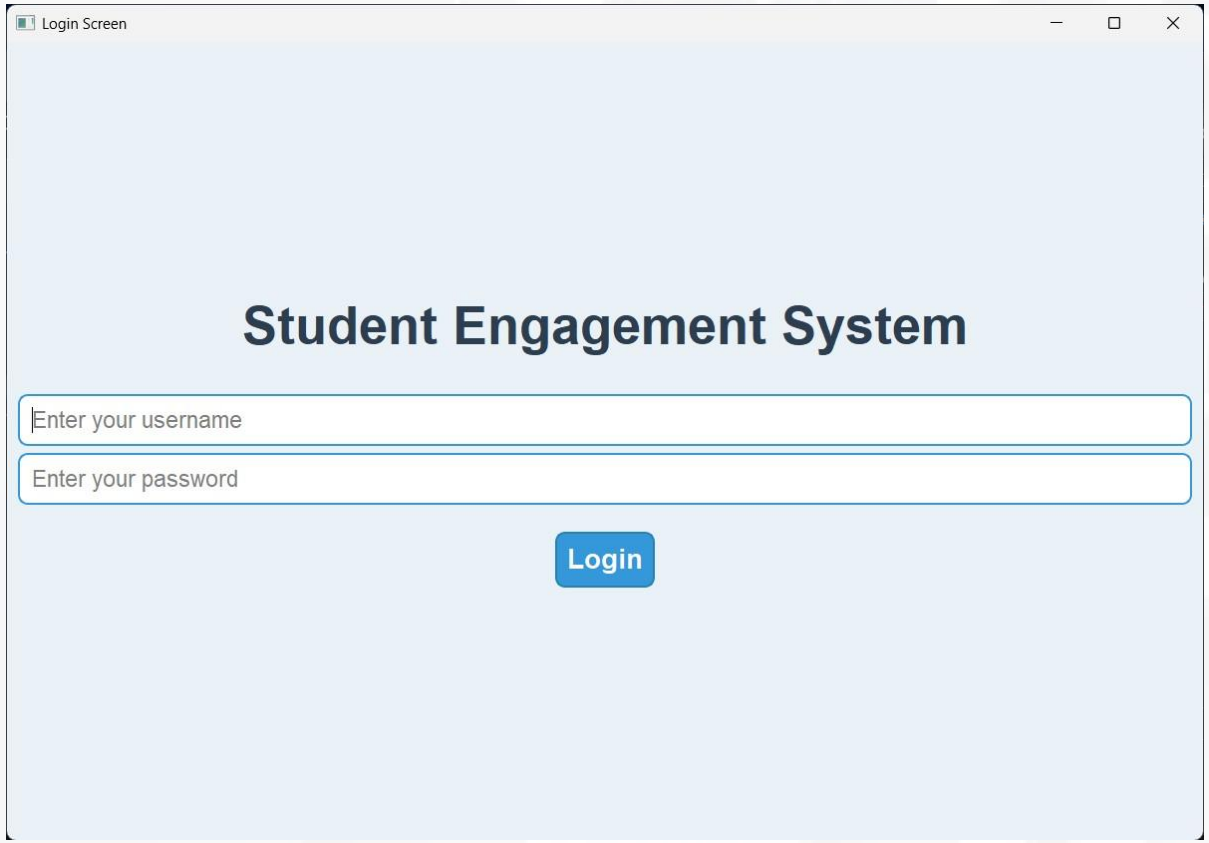


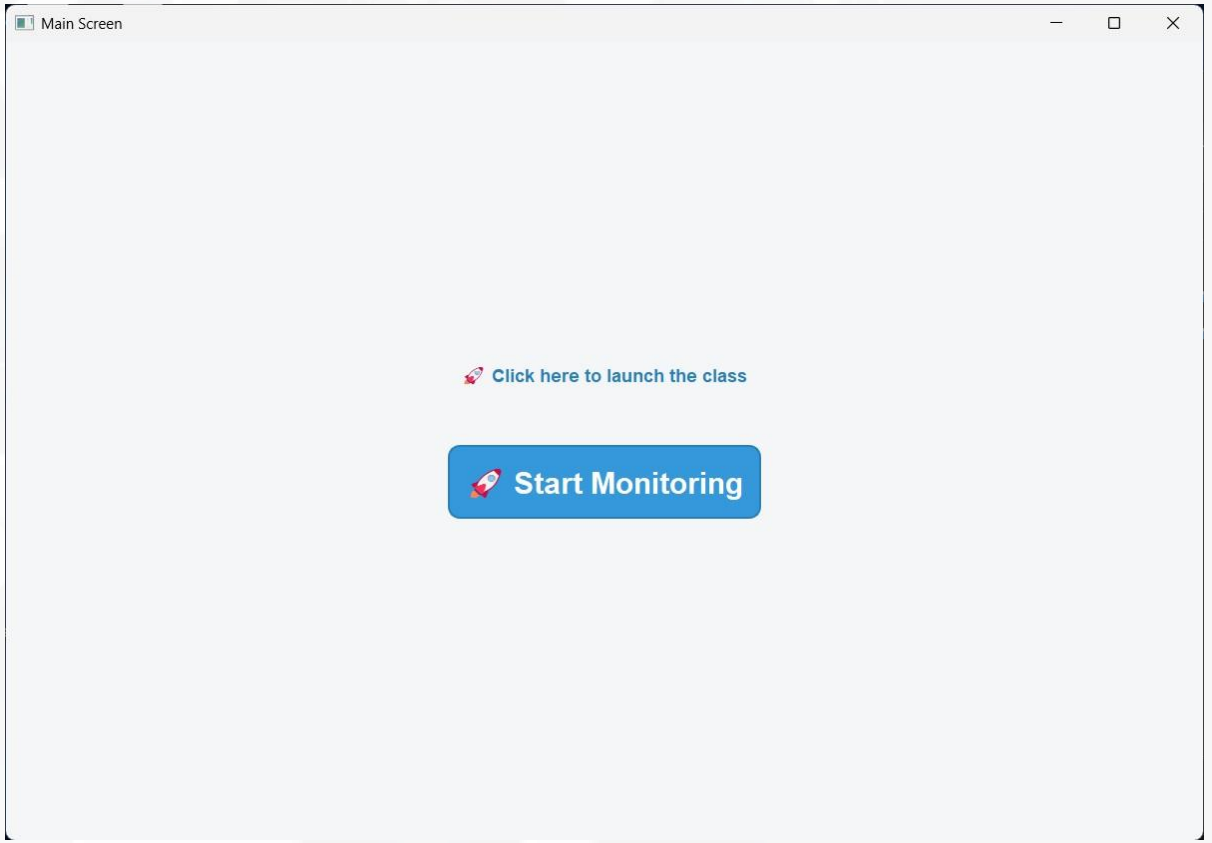
Implementation Details

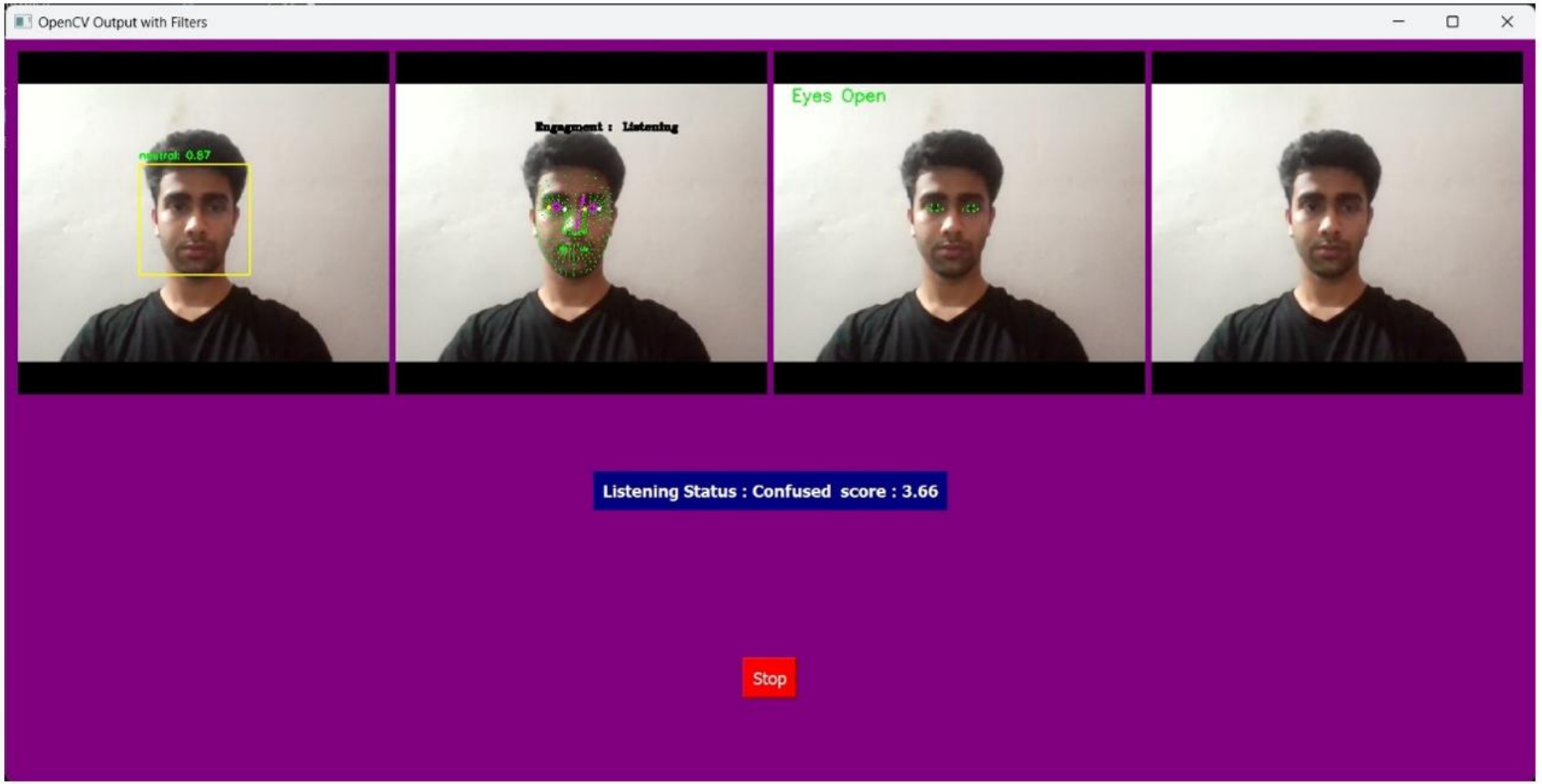
- Python programming language is used in the development of the project
- Pyqt module is used to develop the gui for the project
- The backend server is built using FastAPI

Project Output

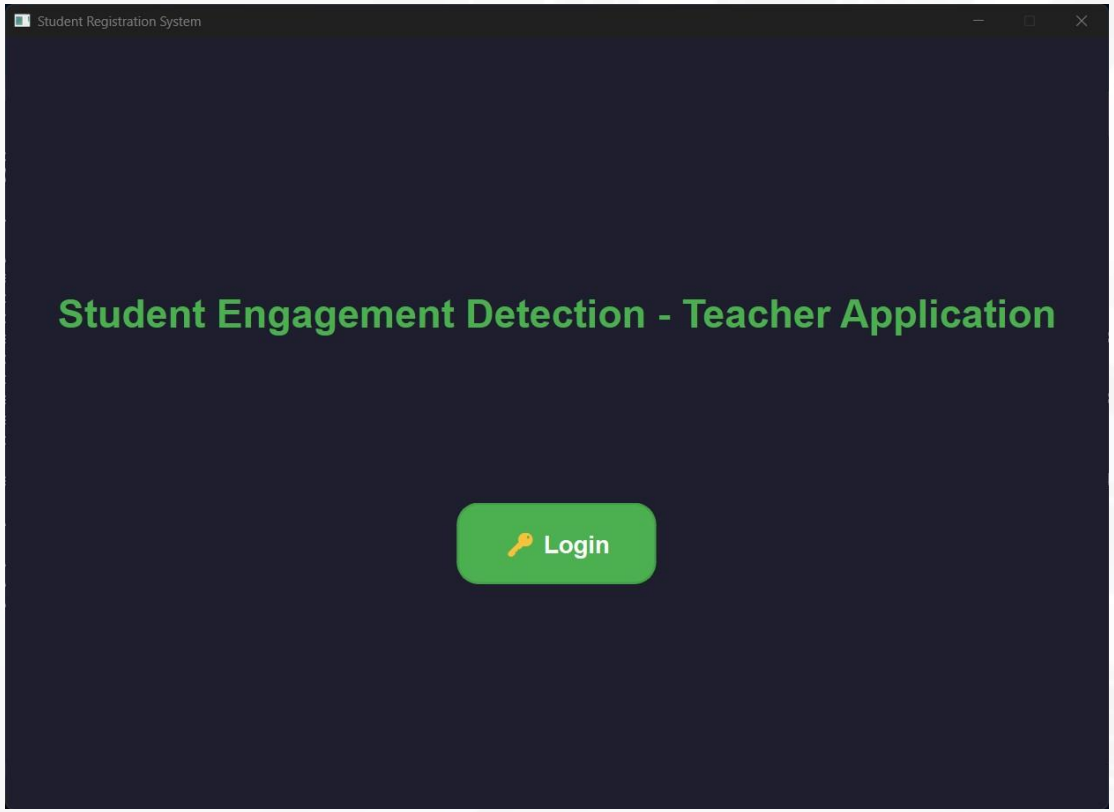
- Student application

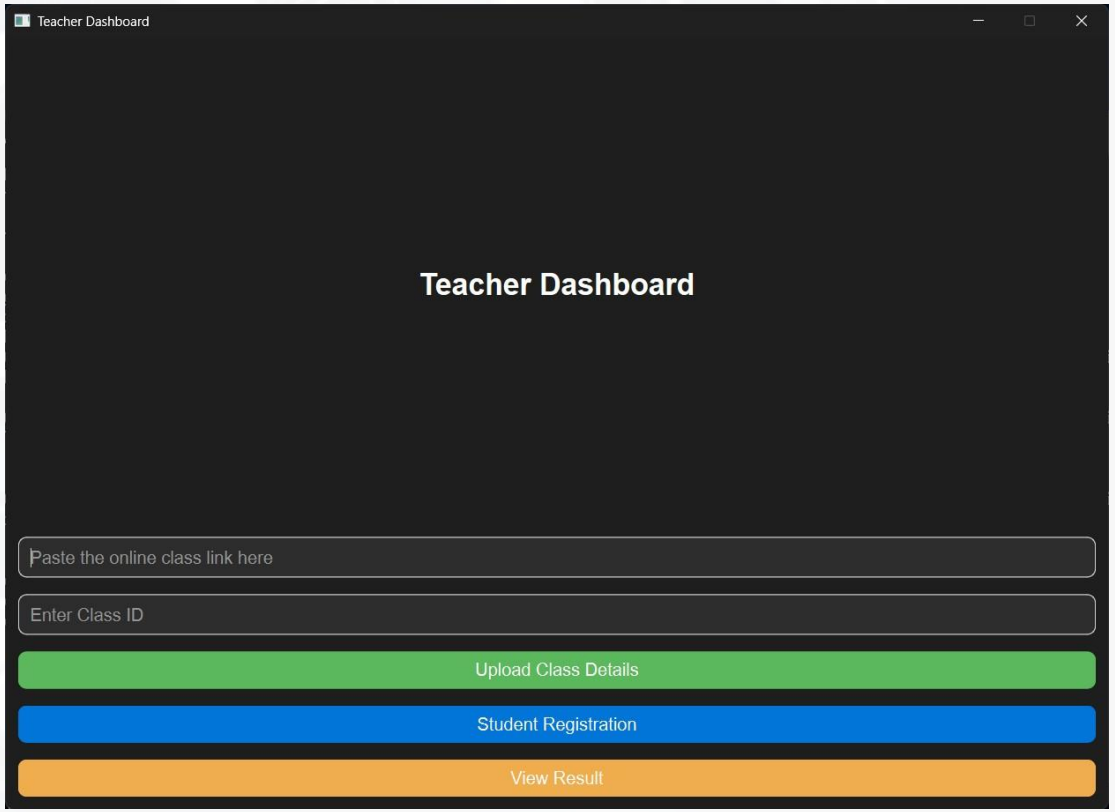


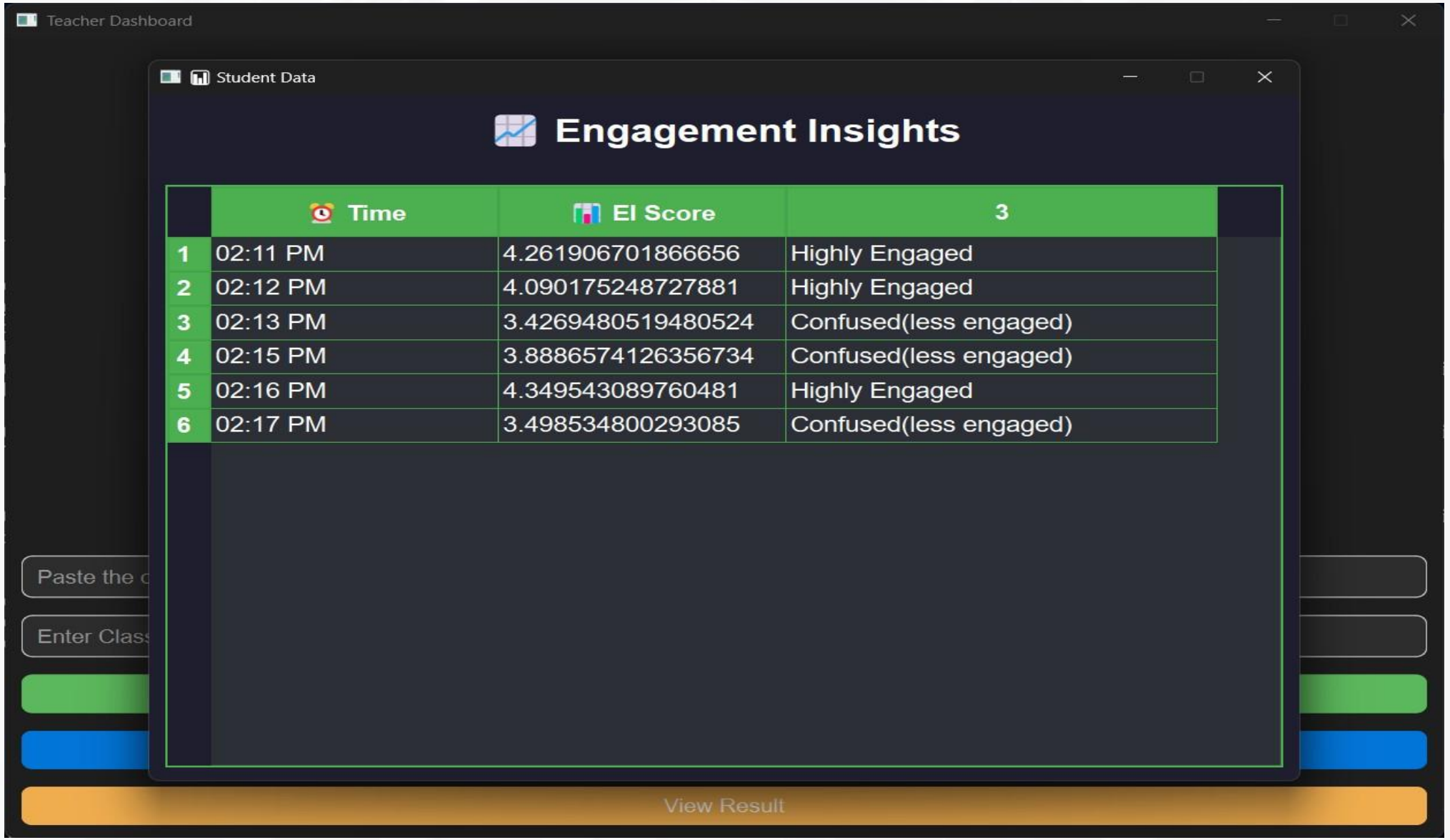



OpenCV Output with Filters
neutral: 0.87
Engagment : Listening
Eyes Open
Listening Status : Confused score : 3.66
Stop

- Teacher application






Teacher Dashboard
Student Data
Engagement Insights
Time
EI Score
3
1 02:11 PM 4.261906701866656 Highly Engaged
2 02:12 PM 4.090175248727881 Highly Engaged
3 02:13 PM 3.4269480519480524 Confused(less engaged)
4 02:15 PM 3.8886574126356734 Confused(less engaged)
5 02:16 PM 4.349543089760481 Highly Engaged
6 02:17 PM 3.498534800293085 Confused(less engaged)
Paste the
Enter Class
View Result

Conclusion

- This project successfully implements a Student Engagement Detection System using FastAPI and PyQt6.
- It enables real-time collection and monitoring of Engagement Index (EI) scores, storing minute-wise averages in a MySQL database.
- The modern PyQt6 GUI provides an intuitive interface for teachers to manage student data and engagement tracking. With real-time updates and seamless performance, this system enhances classroom monitoring and can be expanded with AI analytics and mobile integration in the future.

THANK YOU..

ANY QUERIES????