International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 10 Issue: 12 | Dec 2023 www.irjet.net p-ISSN: 2395-0072

STUDENT ENGAGEMENT MONITORING IN ONLINE LEARNING ENVIRONMENT USING FACE DETECTION

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Abstract - *Student engagement is one of the most important factors in student achievement. Many schools are aware of this and have initiated programs to monitor how engaged students are in school. Tracking student engagement not only helps teachers assess their teaching methods; it also helps administrators know which aspects of the school environment need more attention. In order to measure student engagement, many schools can incorporate systems that track a child's response time during individual lessons. We all know that the internet has changed education forever, and for the better. An accessible online world has allowed students to learn at their own pace in a more natural environment with new opportunities for collaboration, creativity, and growth. But what is not commonly understood is just how crucial student engagement on an online course can be to its success. Student engagement is fundamental to educational success. Engagement monitoring can help identify what students find interesting and engaging in the classroom, what they want, what makes them uncomfortable, and what they need.*

Key Words: Online Monitoring, Face Recognition, Student Engagement, Online Course, Classroom Engagement.

1. INTRODUCTION

Online learning, while potentially prestigious, carries a stigma of "lack of engagement" from the oftentimes-lonely student.

With so much time being spent in isolation, there is often less face to face contact with other students and instructors. In this post we will discuss how a thriving online course can maintain high levels of engagement with an engaging syllabus and interactive assignments. We will also introduce a free tool for monitoring student activity in the class to help keep everyone engaged through data collection and analysis.

Online learning and the technologies that go along with it have the potential to make higher education both more expensive and accessible. This accessibility, while potentially a good thing in that it will allow for more students who otherwise would not be able to attend college, can also result in a significantly reduced overall quality of learning. While an online course can be just as rigorous as a traditional one, it must be monitored carefully to ensure all students are on track. The syllabus must always remain the same. The assignments must always be submitted on time. In this article we will focus on just one question: how do you know the students are getting what they need out of the class, and are they engaged?

Student engagement is critical for retention, success and efficacy of online learning. It has been found that student engagement often leads to greater satisfaction during the education process which can, in turn lead to better participation in other activities as well. There are various ways for instructors and educators to engage students while providing effective feedback through assessment and beyond.

1.1 Motivation

Active learning necessitates student involvement and interest in the classroom. To do this, they must be extremely motivated. To put it another way, highly motivated students make an effort to participate in class. As a result, understanding a student's degree of motivation is crucial for active engagement in class. According to the study, motivation level is related to class participation, vocational school students are more affected by motivating aspects, and motivation level decreases as grade level increases.

1.2 Objectives

- First and foremost, we will authenticate the student that they themselves are attending the lecture or not.
- We want to simplify professors' tasks for attendance.
- This in turn will lead to improved effectiveness and efficiency of online learning.

1.3 Scope

There are many benefits to monitoring student progress in the classroom. Regular and informal assessment provides teachers with valuable information on the progress and achievement of their students. Not only this, but monitoring students'

progress gives teachers the opportunity to reflect on their teaching and to evaluate the effect of the teaching methods they are using. Another major benefit of monitoring student progress is that it allows the teacher to evaluate the effectiveness of his own teaching. If the rest of the class finds it difficult to understand or express a particular purpose, it may not be the students' ability to solve the problem. As a result, teachers can help students reach their educational goals.

With information from assessment and activity samples, the teacher can work with the student to establish learning goals that are achievable and help each student stay on track. With continuous student supervision, teachers can establish an achievable and individual level of progress for each learner, or vice versa and intervene where necessary.

2. RELATED WORK

[1] A method for detecting learner participation has been created using the Local Directional Pattern (LDP) and the Deep Belief Network (DBN). In each frame, facial characteristics were extracted as LDP-histograms by applying a fixed mask to the identified face region of interest. During classification, involvement detection judgements were conducted at two levels (not engaged and engaged) and three levels (not engaged, usually engaged, and extremely involved).

[2] For engagement detection, we leverage behavioral and emotional data from students. All Convolutional Network, Network in Network, Very Deep Convolutional Network, Conv-Pool Convolutional Network, and a proposed model combining some special features from the above models have been tested for behavioral and emotional dimensions detection to detect student engagement in online learning.

[3] During a lesson, a web application was created to facilitate various sorts of student-teacher interaction. The programme collected all of the auditory exchanges and labelled the data so that further analysis of the data could be done quickly.

[4] The open-source dataset was used to demonstrate a web-camera-based system for evaluating the possibilities of automated student engagement monitoring and assessment. A case study was conducted to get insight into the genuine challenges of student engagement detection and identification when students are allowed to sit and move freely during learning. The student images in the dataset are used to train a deep learning CNN model, which is then used for real-time monitoring and assessment of student involvement.

[5] The idea is to make existing facial recognition systems more accurate. From still pictures and video frames, face recognition is possible.

[6] It monitors keyboard, mouse, and clickstream data. A webcam for estimating head pose. Browser tab activation, upgrades and deletions, and website screenshots are all possible. Listener for browser information and window focus.

[7] It measures the engagement of the student through facial recognition by detecting various features of students face such as head pose, facial fiducial points, learned features, eye gaze, etc.

[8] It depends on head stance and basic facial gestures like brow raise, eye closure, and upper lip rise to form their judgments about student interest.

[9] To achieve its purpose, it applied machine learning approaches to educational data acquired in a hybrid learning environment. The study focused on the correlations between engagement level and student academic achievement, as well as how machine learning algorithms could assist educators in automatically monitoring and responding to students' learning progress concerns, allowing them to focus on other pedagogical issues.

3. PROPOSED SYSTEM

This System will identify whether the student is attending the lecture or not, and the tool automatically registers the time he/she is in class (class start time relative to the system's clock). It also gathers his or her head position. Our aim will be to have a score of attentiveness and an average score per each student. Based on the results we will be given feedback, recommend activities and observe the student's behavior. We will also be monitoring mouse and keyboard clicks. If the student is not attending, we will notify the instructor. We will also be tracking some of the elements such as browser tabs, website snapshots and other activity. In the end we will be making a dashboard for instructors to present to their students with their average student engagement levels. The dashboard will contain a lot of valuable information for instructors such as classes with low engagement levels, students who are not attending lectures etc. The information collected from our tracking system can be used in many different ways such as improving classroom or lecture training and how to improve student performance i.e., what questions should be asked during each lecture, what questions should be asked after each lecture etc. And it will authenticate students via facial recognition and head pose estimation.

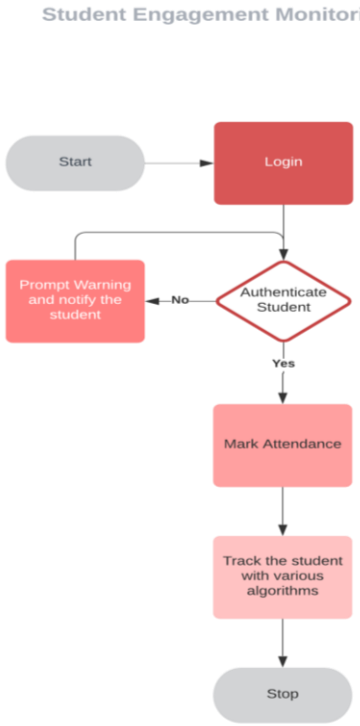

Fig 1: Block Diagram of proposed system

4. IMPLEMENTATION

The system is divided into 2 parts.

A. Face Recognition

Face recognition is a technique that uses a picture, video, or other audiovisual feature of a person's face to identify or authenticate them. This type of identification is commonly used to get access to a programme, system, or service. It's a biometric identification approach that relies on body measurements, in this instance the face and head, to authenticate a person's identity. The system captures a collection of unique biometric data related with a person's face and facial expression in order to identify, verify, and/or authenticate them. We have created a face recognition model using React.js which gives us the emotion of students as they are neutral, sad, happy, surprised etc. and face landmarks as shown in fig.

Computerized face recognition is a technology used to identify or verify a person from their facial biometric pattern and data. This is based on the analysis of certain body measures that make it possible to recognize the person that is being checked. Face recognition uses computer, software and hardware technology to detect, process, match and compare facial data of people in an image or video file. The system has three steps: pre-processing, feature extraction and matching.

B. Mark the Attendance for Students

We will create a Dataset in that we will have images of all the students and through face recognition we will compare the face with the image and if it matches then only it will mark the attendance. To check the attentiveness of the student we are planning to use the Daisee Dataset which will help us to identify the boredom of Students and Head pose Estimation.

i)DAISEE

With 9068 video samples from 112 people, DAiSEE is the world's first multi-label video classification dataset for identifying user emotive states of engagement, boredom, perplexity, and discontent in the wild. For each of the emotional states, there are four degrees of labels: low, very low, high, and very high.

ii) Head Pose Estimation

Head Pose Estimation is a computer vision technique for predicting and tracking a person's or object's location. This is accomplished by examining a person's or object's stance and orientation in combination.

A Two-Step Approach to Head Pose Estimation

First, as a preprocessing step, we need to apply a face detection algorithm to an image to detect regions of interest, human faces, presented in the image. One could use any DL-based method for face detection, including Faster R-CNN or SSD (available in OpenCV). This step is required to find regions that are cropped from the image and then are processed further in the next steps of the algorithm.

A possible result of the face detection algorithm:

Fig 2: Face Detection Example

Second, we need to establish the correspondence between 2D facial landmarks in the image and their 3D positions. Under facial landmarks we mean some facial key points, e.g., eyes, eyebrows, a nose tip, lips, chin, etc. Obtaining this alignment is necessary for the next step of the algorithm, where the alignment will be used for the optimization procedure.

C. Results and Discussion

We decided to use the daisee dataset to identify whether or not a student was bored and if they were attentive. For this project we made a Dataset of the students and took pictures of them. We then placed one picture for each student under each name so that we could use face recognition to compare it with their own photo and mark where they were sitting during lecture.

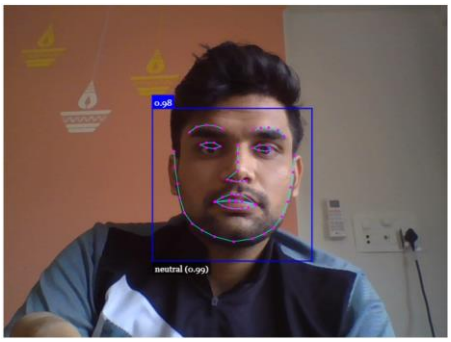

Fig 3: Neutral Emotion

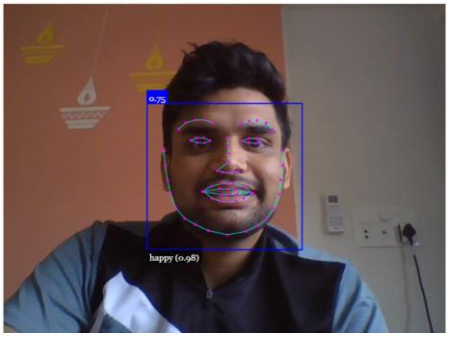

Fig 4: Happy Emotion

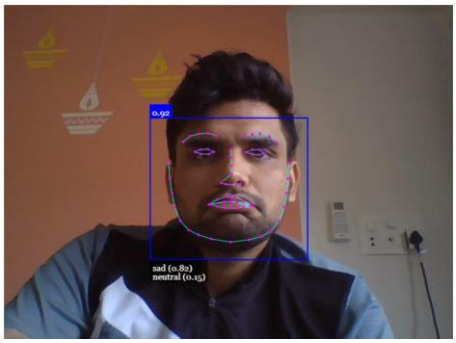

Fig 5: Sad Emotion

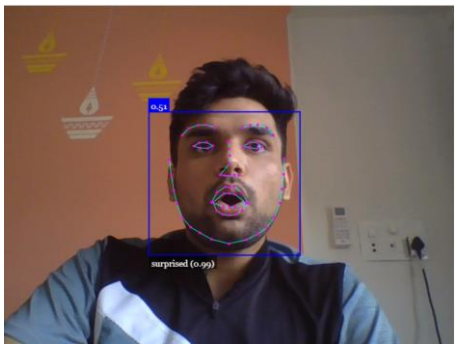

Fig 6: Surprised Emotion

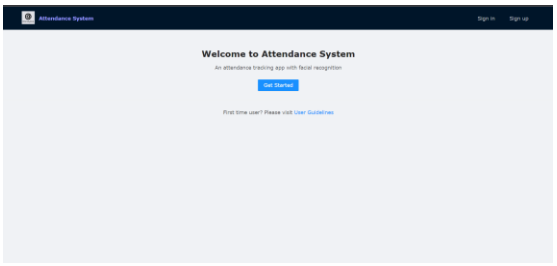

Fig 7: Login Page

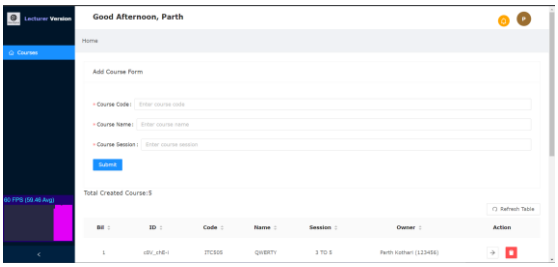

Fig 8: Lecturer Page

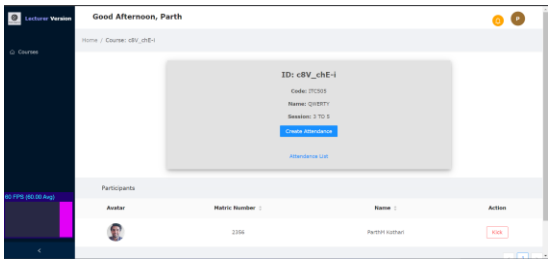

Fig 9: Course Page

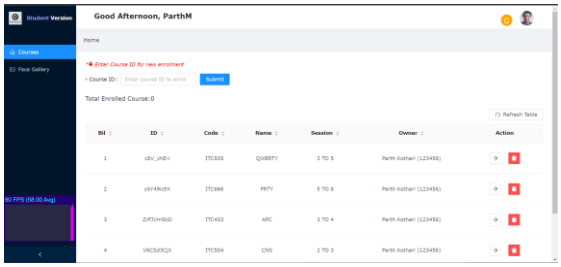

Fig 10: Student Page

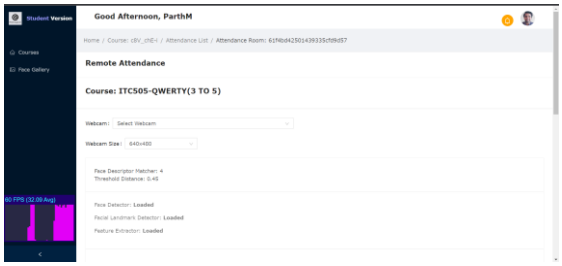

Fig 11: Student Attendance Input Page

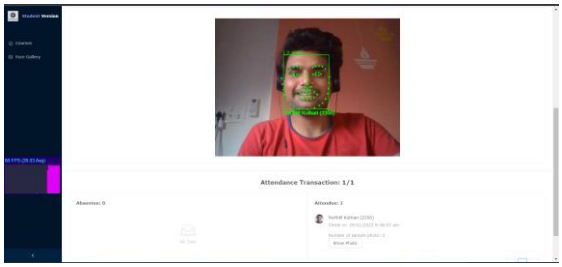

Fig 12: Student Attendance Recognition Page

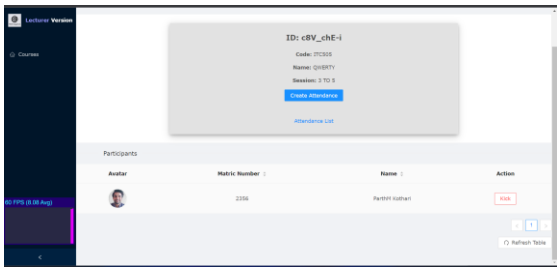

Fig 13: Course Participants Page

5. CONCLUSIONS

Advanced research is required to complete the phases of the approach for gauging student involvement. In addition, we give a brief summary of the project as well as some results. We explain to them how this assignment will help them strengthen their research abilities. It's worth noting that one of the most difficult aspects of involving students in advanced research is motivating them. While conducting such study, it is essential that you pay attention to the students' motivation.

ACKNOWLEDGEMENT

The credit behind the working of this project goes to all the students who were directly involved in creating it as well as the mentors who guided us along every step of the way. It gives us immense pleasure to give our hearty welcome to various people directly or indirectly associated with our present project work. Our project guide Prof. Vijaya Pinjarkar, Asst. Prof. in the Department of Information Technology. She not only mentored us along the way and provided us with her valuable insights and resources, but also took care of every student's well-being throughout the process of creating this project. She made sure there was a timely fashion of updates so that the team never missed a deadline.

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