Project Proposal Reference No. : 46S_BE_0419

Project Proposal entitled: REAL TIME ATTENTION SPAN TRACKING IN ONLINE EDUCATION

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Keywords: Artificial Intelligence, Attention, Blink rate, Drowsiness, Eye gaze tracking, Emotion classification, Face recognition, Body Posture estimation, Noise detection.

Introduction: The increasing demand for online education opens the gate to automation in the field. One major issue in the online mode of lectures is that students tend to lose their concentration after a certain period and there is no automated mechanism to monitor their activities during the classes. Some students tend to just start a lecture online and move away from the place, or might even use a proxy to write online tests for them. This situation also takes place in online course platforms such as EdX and Coursera where the student tries to skip lectures just for the sake of completion and certification. The loss in concentration not only affects the student's knowledge level but also hurts the society by producing low-skilled labourers.

Objectives: To present a method that uses a camera feed and a mouthpiece contribution to monitor student's continuing attention levels during online classes. To improve the quality of online education. To tackle the issues involved in online education using five parameters. We used the face recognition model to verify the student attending the online class. we have implemented and used lightweight models to reduce the processing time.

Methodology: We are planning to implement this project using the following steps.

1. To detect Facial Landmark we are using Haar cascade algorithm.
2. To Face Recognition we are using LBPH algorithm
3. To detect body pose we are using CNN or R-CNN

Haar Cascade

Here we will work with face detection. Initially, the algorithm needs a lot of positive images (images of faces) and negative images (images without faces) to train the classifier.

Then we need to extract features from it. For this, haar features shown in below image are used. They are just like our convolutional kernel. Each feature is a single value obtained by subtracting sum of pixels under white rectangle from sum of pixels under black rectangle.

LBPH

Local Binary Patterns Histogram algorithm. It is based on local binary operator. It is widely used in facial recognition due to its computational simplicity and discriminative power.

The steps involved to achieve this are:

- creating dataset
- face acquisition
- feature extraction
- Classification

CNN

OpenPose also uses CNN as its main architecture. It consists of a VGG-19 convolutional network that is used to extract patterns and representations from the given input. The output from the VGG-19 goes into two branches of convolutional networks.

Result and Conclusion:

we have implemented a system to tackle the issues involved in online education using five parameters. We used the face recognition model to verify the student attending the online class. We used the other five parameters - blink rate, eye gaze, emotion, posture, and noise level to calculate the attention level of the student throughout the lecture. Since this involves real-time processing, we have implemented and used lightweight models to reduce the processing time. We visualize the scores in the form of a live graph and generate automated reports. The feedback generated can be used for: 1) Evaluating student performance 2) Improving teaching standards 3) Preventing malpractice during online examinations As a part of future works, we can improve our system’s performance further by training our models using more data. Also, the same attention tracking mechanism can be further optimized to simultaneously work with multiple subjects in a classroom using video footage from the CCTV cameras. Moreover, we have used human observed attention scores as ground truth-values as we currently do not have any dataset for measuring the attention span during online lectures. A standard dataset can help to evaluate the system’s performance more reliably.

Real-time attention span tracking in online education has the potential for several future works. Integrating attention span tracking with LMS can provide insights to both students and instructors about the effectiveness of the course content and their engagement levels. Attention span tracking can help in identifying areas of interest and disinterest among students. This can enable personalized learning by tailoring course content to individual students' needs and preferences. Attention span tracking data can be integrated with adaptive learning systems to provide more accurate and personalized recommendations. Attention span tracking data can be integrated with gamification techniques to provide more effective engagement incentives.

Scope of Future Work: The future work in real-time attention span tracking in online education has a broad scope with several potential areas of focus. Here are some aspects that can be explored:

Refining attention metrics: Develop more sophisticated metrics to assess attention span and engagement. This could involve combining multiple data sources, such as eye-tracking, facial expression analysis, or biometric data, to gain a more comprehensive understanding of attention levels.

Automated interventions: Design automated interventions based on real-time attention data. For instance, the system could provide prompts or reminders to students who show signs of disengagement, offer personalized content recommendations to re-engage them, or suggest activities to break up long periods of passive learning.

Adaptive learning pathways: Utilize attention span data to dynamically adapt the learning pathway for individual students. By identifying areas where attention tends to wane, the system can adjust the content delivery or learning activities to maintain engagement and optimize learning outcomes.

Student feedback and self-awareness: Provide students with real-time feedback on their attention span and engagement levels. This feedback can help students become more self-aware of their learning behaviours and encourage them to take proactive steps to improve their focus and involvement.

Instructor support: Develop tools and visualizations to assist instructors in interpreting attention span data. This can help instructors identify patterns, trends, and potential areas for improvement in their teaching methods or course materials. It can also enable timely interventions and personalized support for students.

The scope of future work in real-time attention span tracking is vast, offering exciting opportunities to improve online education through personalized learning, effective interventions, and a deeper understanding of student engagement.