Online Student Attention Analytics using Hybrid Machine Learning

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Abstract: *Monitoring a student while they are in a video conferencing classroom is a non-intrusive approach. To digitizing student's behaviour, understanding student's attention span and what type of behaviour may indicate a lack of attention is fundamental for understanding and consequently improving the dynamics of a lecture. The main goal of this project is to develop an autonomous agent which can provide information to both teachers and students. And based on the information received we will be able to know how interactive or enthusiastic the class was which will be helpful for the teacher to improve in the way they teach or will help to guide the student. With the help of this, the teacher will get to know the topic that was boring and will be able to focus on that.*

Keywords: Machine Learning, Imutils, Multiple Regression, etc.

I. INTRODUCTION

A. Overview

In present situation where online classes are being the most comfortable means of teaching and studying for the teachers and student's attention analysis proves to be one of the key features needed to succeed in online classes. The teacher's does not know which person is concentrating and which topic is boring since they could not see the students in online mode like they see in offline in their respective classrooms. In order to give a better idea to the teachers and to benefit the students we propose a system that will be giving the teachers a detailed analysis on who is concentrating in the class and which topic seems to be boring etc. According to the given analysis the improvements can be made by the teachers to help the students study and understand well.

B. Motivation

One of the major problems faced by the teachers while teaching in online class is monitoring the student's attention, to get to know how students are responding the class whether they are understanding or not and how they are feeling i.e., interesting or not. While teaching in online, teachers cannot understand the student's behaviour as they can't monitor the students continuously. So, the question raise's "How come teachers will get to know the student's attention in online classes?"

C. Problem Definition and Objective

In online education one of the most drawbacks is lack of monitoring the students continuously. In order to continuously track the student's attention during online lecture, we propose student attention analyser which tracks student's concentration and behaviour during the lectures. To analyse the student behaviour based on facial expressions that are recognised. To find out whether the student had focused on the topic and whether he/she has an interest in a particular topic.

With the help of this information the teacher will have an idea about what topic to repeat again where the students didn't focus and with the help of the given information the teacher can make the necessary changes.

In this project we aim to give a well analysed data of the students from the teacher of each particular person that will be helpful for the teachers to understand and analyse the student's behaviour and attention span in the class. Because of this pandemic it's not very easy for 2 teachers to check upon the students through online mode henceforth this mechanism will allow the teachers to have a check on every student based on the data provided.

D. Project Motivation and Limitation

The main aim of the project is to analyze the student's attention during the online lectures and with the help of these information the teacher will have an idea about what topic to repeat again where the students didn't focus and with the help of the given information the teacher can make the necessary changes. At the end of the project the result will be shown in the form of graphs, pie charts and reports which reflects the student's attention during that whole lecture, so that teachers will came to know at which point of time students feeling interesting or drowsy and make necessary changes so that online lectures will become more effective. To improve the attention limitation in online lectures we are introducing this model with specific algorithms to make it make more efficient. By using some preprocessing techniques, we are making the model significant which makes to improve attention analysis.

The algorithms which are used in the model make it to work with more accuracy. And gets the results which gives the students attention report during the whole online lecture and makes the teachers to do necessary changes and provide quality learning.

II. METHODOLOGIES FOR PROBLEM SOLVING

The problems faced in student analysis can be solved by using the following methodologies:

There is a default position of how a student to sit in a class with hands straight not covering any part of face and the student face to be positioned in front of the camera to know details 3 of their face expression.

- Drowsiness, eye movement, mouth aspect Each eye is represented by 6 (x, y)-coordinates, starting at the left-corner of the eye (as if you were looking at the person), and then working clockwise around the remainder of the region:
- HOG Histogram of Oriented Gradients (HOG) algorithm is used to encode images to create a simplified version of the image. It was first created by Navneet Dalal and Bill Triggs. The essential thought behind the histogram of oriented gradients descriptor is that local object appearance and shape within an image can be described by the distribution of intensity gradients or edge directions.
- DESCRIPTION OF FEATURES: If the distance between the eye lids is measured for finding the eye closure then it may not be the best parameter as this measuring value changes from person to person. Hence the aspect ratio is a way to flawless parameter to exactly find the eye closure.

III. ALGORITHM

A. Haar Cascade:

Haar Cascade is an object detection algorithm, which is used to identify objects in an image or any real time video. The algorithm uses edge or line detection methods. The algorithm is feed with a lot of images with faces as positive images, and a lot of images without images as negative images to train. These include models for eye detection, face detection, lower body and upper body detection, license plate detection etc.

B. CLAHE:

Contrastive Limited Adaptive Equalization Histogram Equalization Histogram Equalization is a technique which is used for image processing. By using histogram, it adjusts the contrast levels of an image.

To reduce noise, it uses Contrast limited AHE which limits the contrast amplification. The noise which exceeds the clip limit equally across all histogram will reduce the noise by distributing that part of the histogram.

C. get frontal face detector ():

get_frontal_face_detector() is a function which returns the facial information.

This method we using is made using the classic Histogram of Oriented Gradients (HOG) feature combined with a linear classifier, an image pyramid, and sliding window detection scheme. It consists of more advanced CNN based face detector. It also has the great facial landmark key point detector.

IV. CONCLUSION

This project helps in detecting and tracking the faces of the student who are present during the online lecture. This can share the details of user, such as name of the student how much he has attended attentively, which point he lost his interest about the topics and overall attention of the student during the lecture .Finally, this project helps the teacher to track and monitor their students behavior and attention more effectively.

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