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# Smart Classroom

Ankita Kataruka<sup>1</sup>, Amrita Agarwal<sup>2</sup>, Abhay Patel<sup>3</sup>, Diksha Jadhav<sup>4</sup>

<sup>1, 2, 3, 4</sup>Dr. D Y Patil School of Engineering and Technology

**Abstract:** *With the growth in technology, education system have also seen a lot of improvement. But still monitoring of student attendance using traditional system consumes too much time which could be employed in a better way inside the classroom. Small changes can tremendously affect bigger changes. Moreover, automated attendance system can help us to check whether a student is sleeping inside the classroom or whether he is proactive inside the classroom. Classroom Management Behavior System can gives us a concise idea of the various emotions students are face inside the classroom. This paper describes different methods used for attendance marking and detection of the level of attention paid in class by students.*

**Keywords:** *Convolutional Neural Network, Rectified Linear Unit, Graphics Processing Unit.*

## I. INTRODUCTION

Everything around the globe is getting digital. And talking about digital the management in schools and colleges is still old. The attendance is taken manually by the teachers and hence a record is maintained. Due to manual attendance a lot of face proxies are given by students for their fellow classmates and friends. Also, sometimes students give teachers a really hard time in maintaining the proper attendance record, which is time consuming and also inefficient. The automated attendance system that use face recognition technology with the help of a video camera fit inside the classroom, captures the objects(students) present and marks the students present in the dataset. Now, if a student is not focusing in the class it will be recorder and the respective teacher will be notified. This will help the professor to pay attention to each and every student in the class properly and hence the overall result of the class will also improve.

## II. LITERATURE SURVEY

A. *Ramos I Bryan, Anna Liza, Bernard G. Santos G. Dadiz Arman (2020).*

This paper co-relates emotion to non-verbal behavior especially facial expression. It aims to analyze the facial expression of students such as fear, surprised, disgust, sad, neutral and anger using Philippines-based corpus. It uses 611 examples which is validated by psychology experts to define the meaning of emotions and to connect with teaching pedagogy which in turn supports decisions on teaching strategies. Haar-Cascade is used for face detection, Gabour filter API is used for features extraction model which gives an accuracy of 80.11%.

B. *Adeshina Sirajdin Olagoke, Soo Siang TEOHI, Haidi Ibrahim I (2020).*

Now a days, Multi-camera systems have gained significant attention especially in the areas like surveillance, tracking, image sensor, image recognition, and computer vision. This paper have focused on the aspect of camera calibration and architecture in a multi-camera formation. It also describe the application of multi-camera systems in the area of surveillance, sports, education, and mobile phones. This also discuss the current challenges faced, progresses made, and potential directions for the future to guide the researchers and scientists who are in need to understand how this area of research is evolving.

C. *Saurabh Daundkar, Ranjan Nath, Rahul Tavnaji, Rahul Gupta, Bhagyashree Dhakulkar (2019)*

This paper provides various ways to mark the attendance of student and to keep an eye on the attention level of the students present in the classroom. It describes face recognition as a combination of two different module. This method gives a accuracy of around 79.39 to 81.94 and hence is quite efficient to use.

D. *Imam Husni Al Amin et al. (2019)*

The attendance system uses faces as objects to be detected and recognized as a person's identity and then stored as a face database. The process of matching face image data captured by the camera with face images that are stored within the face database will end in face identification of the object faces captured by the camera. The face recognition-based attendance system during this study uses a hybrid feature extraction method using CNN-PCA (Convolutional Neural Network – Principal Component Analysis). This combination of methods is meant to supply a more accurate feature extraction method.

The face recognition based attendance system using this camera is extremely effective and efficient to further improve the accuracy of user data. This face recognition-based attendance system using this camera has very accurate data processing and high accuracy so that it can produce a system that is reliable and powerful to identify human faces in realtime.

*E. Rachoori Keerthi, Pallam Ravi, A. Obulesh, Deepika.S (2018)*

The objective of this paper is to give a brief overview of Facial Expression Recognition system and to discuss various techniques which can be adopted to implement FER system. A robust Facial Expression Recognition system, has to satisfy the performance in terms of accuracy, recognition rate and computational complexity. In addition, this system should satisfy pose-invariance, illumination variance.

*F. Aishwarya Sarkale, Kaiwant Shah, Anandji Chaudhary, Tatwadarshi P. N. (2018)*

This paper puts light on the need of automated attendance system. It provides 3 ways of this automation i.e. biometric based, smart card based and web based. The biometric one is implemented by creating a data set for student images and marking the attendance by recognizing their faces. The system is linked with Wamp server which contains the dataset of student.

*G. Himanshu Tiwari et al. (2018)*

This paper elaborates the idea of maintaining the attendance using a real time face recognition system. To represent the facial profiles of images such as curves of face followed by finding their vectors and then with the use of deviation from the norms to classify other facial profiles. Basically, this paper suggest to create an independent measured vector which can further be used to compare with other vectors in the database. The model is basically using biometric based attendance system to mark the attendance of the students automatically by detecting and recognizing their faces. The system has the capability to automatically mark the attendance of a student after getting recognized.

*H. Dr R. Boulic, Directeur de these, Prof. X. Ochoa, rapporteur, Prof. P. Dillenbourg, Prof. D. Gasevic, , Président du jury rapporteur Prof. D. Gatica-Perez, rapporteur(2015).*

Technologies that we are using have a jumped between collecting broad demographics for assessing television channel ratings, to using facial analysis of an individual in a controlled viewing. The fact that information can be assessed on very large samples or on a very small sample leaves a lot of room for our discussion. We can extract from the activity but when do the collection costs, it outweigh the benefits. We will consider our current explorations to be well balanced in this aspect. Human contact should, after all, remain human.

### III. PROCEDURE FOLLOWED IN THE PROPOSED SOLUTION

Starting with mobilenet algorithm the attendance records of students are maintained. All the data is stored in influx database. After that to calculate the attentively, happiness and a few more indexes handmade CNN and RmNet are used. In the end with the help of Grafana, analysis is performed for students' behavior.



Fig.1: Proposed Solution Flowchart

*A. MobileNet*

For the face detection, mobilenet algorithm has been used. Its main objective is to implement the classification of various objects (different faces of students) with the highest possible efficiency and least resources. The accuracy of the model is majorly reliable on two parameters, the pixels and the particular quantity of images the net has been trained on.

There are a few methods that can be used for detection. The method used here is YOLO (YOU ONLY LOOK ONCE).YOLO isolates each picture into a lattice of  $S \times S$  and every matrix predicts  $N$  jumping boxes and certainty. The certainty mirrors the precision of the bounding box and whether the jumping box really contains an object(regardless of class). YOLO likewise predicts the order score for each crate for each class in preparing. You can join both the classes to ascertain the likelihood of each class being available in an anticipated box. In this way, complete  $S \times S \times N$  contours are anticipated. In the project, mobilenet version 2 is used for automatic attendance.

### B. RmNet (Recurring Metric Networks)

For the monitoring of the behavior of students and recording the change in action rmnet is used in the model. There is an action detector in the model that is based on rment and implements depth-wise convolutions to decrease the amount of computations for 3X3 convolution block. Various actions possibly detected are sitting, standing, raising hand etc. It inputs an image with its parameters- height, width, number of channels and batch size.

### C. AffectNet

AffectNet is the dataset used for detection of various index calculation like happiness, sadness and a few more. It is used by collecting various facial images. Affect is describes as a term that is used to describe the outward expression of emotions of various people. AffectNet consists of more than 1 million facial images that are collected from various sources by using trio of important search engines and applying one thousand two hundred and fifty emotion related key points in various languages. About 1/2 of the collected pictures (~440K) are manually added for the presence of seven basic face emotions and the magnitude of emotional factors. Manually added for the presence of seven basic face emotions and the magnitude of emotional factors.



Fig.2: Face Net Extraction Feature

The total amount of the images used in validation is 2,500.

### D. CNN

CNN for the calculation of attentively index handmade cnn architecture is used. Head pose estimation network based on simple, handmade CNN architecture is implemented in this model. Angle regression layers are convolutions + ReLU + batch norm + fully connected with one output.

### E. Influx Database

Influx Database: Influx database is used in this model. It is an open-source time series database. It is fast, provides high storage and supports real-time analytics.

Grafana: Grafana is used for representation of charts, graphs and alerts. It provides a multi-platform open source analytics and interactive visualization.

## IV. CONCLUSION AND FUTURE SCOPE

With advancements in technology, the algorithms accuracy will definitely grow. These algorithms used would become obsolete so newer algorithms would need to replace the old ones. Moreover, with better GPU and higher processor, the overall time to get an accurate result can be reduced drastically. As more datasets for facial records are made, better would be the chances of getting an accurate result. This can too be changed for future purpose. The classroom management behavior system helps in increasing the functionality between teacher and student. As time goes on, better methods for monitoring the students can be achieved like implementing a camera inside the classroom at different angles for only a limited number of students. This means that a particular camera will monitor only a handful of students, therefore increasing the accuracy. However, this requires more investment and maybe in the future, the prices for these cameras will fall down, helping in achieving this need for monitoring a bunch of students.

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