

# Smart classroom attentiveness monitoring system Using Face Detection and Recognition

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**ABSTRACT**— students can feel sleepy/bored in a classroom, the teacher will normally keep teaching, so how will the teachers know if their students are falling asleep or bored.

Our project is the answer to that question.

This paper is actually representing our project which deals with the process of clicking images with use camera and automating check whether his/her eyes is open or not during the online classes and will mark the attendance as absent. To attain this face detection and recognition, we have deployed/implemented Viola-Jones algorithm (Haar Cascade) for face detection and linear binary pattern histograms for face authentication using Python and importing the OPENCV framework to Python. This system updates info of the student and sends message to the school of the Department.

**KEYWORDS:** Python IDE, OPENCV, Haar's Cascade algorithm, Camera.

## I. INTRODUCTION & OBJECTIVE

- ✘ Our aim is to create a specific kind of smart system that will help teachers to identify the non-attentive students and make the teaching experience more interactive.
- ✘ The main objective was to create a smart system that will monitor students' attentiveness in the classroom by tracking their face and specifically their eyes to tell whether a student is drowsy or not. It will alert the teacher if a lot of students are feeling drowsy.
- ✘ Newly updated feature in our program is going to be the Haar Cascade Algorithm that is going to be trained with our custom datasets which will give our program the ability to individually recognize face and differentiate them from other random images.

## II. SCOPE

1. The scope for our project Smart Classroom Attentiveness monitoring system is as follows:
2. The application can be used by staffs and teachers through which students' attentiveness in the classroom by tracking their faces.
3. This application can be helpful for the smart student management system.
4. In case of exams and papers it makes it easy for the teachers who is disturbing the exam by tracking their faces

### 2.1 PROPOSED SYSTEM

This proposed system deals with automatic monitoring of student's eye aspect ratio based on computing Euclidean distance between landmark endings of eye (vertical and horizontal)

This approach uses mainly following technologies:

1. Python as programming language
2. Open-CV Library
3. Tkinter as GUI (Graphics User Interface)
4. Socket programming

## III. LITERATURE REVIEW RELATED TO FACE RECOGNITION AND DETECTION

Face detection is an essential part of a face recognition system. Presence of long hair in front of the eyes or glasses, position, orientation, lighting problem etc are the complications of this system. A review on a number of different approaches to the matter has been introduced below. An implementation of one of the identified approaches of face detection has been included and used for face recognition system. So, let's see some of them and what they said in their papers.

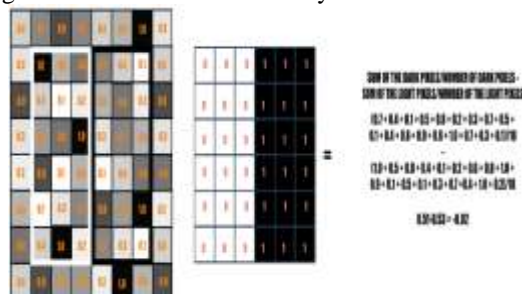
- 1. Mastering Open CV with Practical Computer Vision Projects-** this is Published in the 2010 by Daniel L'elis Baggio. he talks about the Detecting faces using Haar or Eigenfaces, Facial expression recognition, Skin detection and Iris detection.
- 2. Face'O'Mark System** - this paper is published in 2014 by Amey Mohite. This system uses Haar cascade algorithm supported viola and jones algorithm for detecting and recognizing the faces.
- 3. Face Recognition Attendance System** - this paper is published in 2016. In this project face detection and face recognition is employed. Face detection is employed to locate the position of face region and face recognition is employed for marking the understudy's attendance. The database containing haar cascade file in xml format of all the scholarswithin the class is stored and when the student's face matches any one among the faces stored within the database then only the attendance is recorded.
- 4. Class Attendance Using Face Detection** - this paper is published in 2019 by K. Yamini. This proposed system uses face detection for identification of face from objects and face recognition for matching of faces from stored database images (authentication) and supply attendance consistent with the matched face.
- 5. Face detection approach for real time system** - created a sample application that provides insights into the facial features which are extracted. The application is developed using computer vision, primarily OpenCV as the main method of computer vision.
- 6. A Feature-Based Approach to Face Recognition-** gives a detailed explanation about extracting features from pictures. Features of a person's face include eyes, nose, mouth, ears etc. Features are represented using 6 topological graphs and similar faces are identified using deterministic graph matching scheme.
- 7. PERIODICITY OF FACIAL PATTERN** - this paper is published in 2015 by Jigar Patel. this paper is published in 2015 by Jigar Patel. This particular face recognition algorithm includes three main processes: face detection, projection, and search. Face detection identifies potential faces, projection conducts the majority of the image processing and obtains

quantified data from the faces, and therefore the search compares the face data to the face database, finding the closest match, if that one exists.

#### Haar cascade Algorithm Overview: -

A sample calculation of Haar value from an oblong image section has been shown here. The darker areas within the haar feature are pixels with values 1, and therefore the lighter areas are pixels with values 0. Each of those is liable for checking out one particular feature within the image. For ex. in the image given in example, the haarcascade can detect a vertical edge with darker pixels at its right and lighter pixels at its left.

The objective here is to seek out the sum of all the image pixels lying within the darker area of the haar feature and therefore the sum of all the image pixels in the lighter area of the haarcascade. And then find out their difference. Now if the image has a foothold separating dark pixels on the proper and lightweight pixels on the left, then the haar value are going to be closer to 1. That means, it can be said that there is an edge detected if the haarcascade value is closer to 1. In the example above, there's no edge because the haar value is away from 1



#### 3.2 Face recognition -

After the face detection next procedure is to extract the features of face which is named feature extraction. The module recognizes the face of scholars registered for the course. This module matches the features of the student present in the class with the stored images in the database. For face recognition we used several algorithms. They are two things in which this thing work

1. Histogram of Oriented Gradients (HOG)
2. Local Binary Patterns (LBP)

#### Histogram of Oriented Gradients (HOG)

HOG may be a reliable feature extraction system mainly utilized in image processing for object detection. This system works similarly like edge-oriented histograms but differs in that it is computed on a dense grid of uniformly spaced cells and uses

overlapping local contrast normalization for improved accuracy. HOG works by dividing the image into very small connected regions which are called cells and for every cell, finding histogram of gradient direction inside the cell. HOG tries to describe every object within the image with edge direction or intensity gradients

To improve its accuracy, block is said to be as histograms are often contrast-normalized by calculating a measure of the intensity across a bigger region of the image then using this value to normalize all cells within the block. This normalization leads to better realisation to changes in illumination and shadowing.

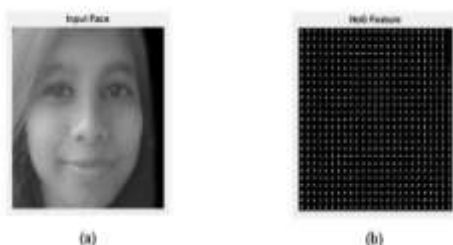


Fig-3:sample image and Extracted HOG Features of sample image.

### Local Binary Pattern (LBP)

We use LBP histogram for face recognition. The local binary pattern (LBP) texture analysis operator is defined as, Basically, it is gray-scale invariant texture measure which is derived from a general definition of texture in a local neighbourhood. It is a kind of visual descriptor used for classification in computer vision. Face recognition algorithms assumes that the face images are well structured and aligned to possess an identical pose. It is impossible to meet these conditions. Histograms of Local Binary Patterns is highly discriminative descriptors and best methodology for face recognition. The operator has been extended to use neighbourhoods of various sizes.

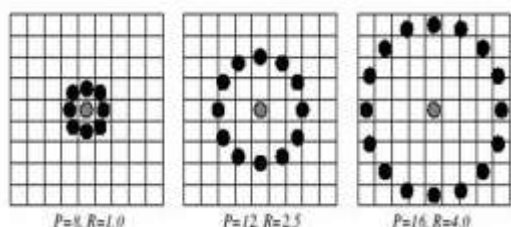


Fig- 4: Circularly symmetric neighbourhood sets

The calculation of the LBP codes is often done within during a single scan through the image. The value of LBP code of a pixel ( xc : yc ) is given by

$$LBP_{P,R}g_p g_c = \sum_{p=0}^{P-1} s(g_p - g_c) 2^p$$

### 3.3 Implementation Parameters–

1. **Eye Aspect Ratio (EAR)** - EAR is the ratio of the length of the eyes and the width of the eyes. The length of the eyes is calculated by finding the six points of the eye which is shown below.



## IV. PYTHON AND OPENCV

### 4.1 Python

Python is high level programming language with dynamics semantics. Python is additionally the scripting language where the appliance are often developed and may be used for several purposes. There are several modules two are often import while implementing the code from algorithm. Some of python interpreter and therefore the extensive standard library is available with none charge. Python is straightforward to find out where reduces the value of program maintenance. Python supports multi-paradigms:

1. Object-oriented
2. Imperative
3. Functional
4. Procedural
5. Reflective

### 4.2 OPENCV

OPENCV is popular library for computer vision. This is used as image processing framework. This library uses machine learning algorithm for detection of faces and recognition of faces via cascade method using haar xml file. There will be thousands of small patterns and features that has got to be authenticated. OPENCV data used to detect objects. We initialize the code with the cascade we would like, then it does the work.

### V. WORKING OF PROPOSED SYSTEM

By using the diagram, you can understand the flow of our system

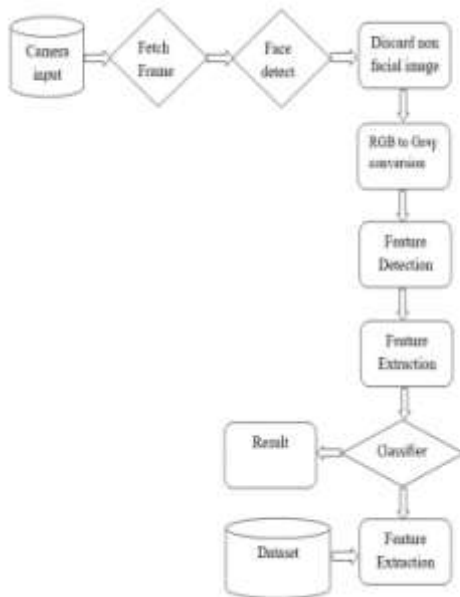
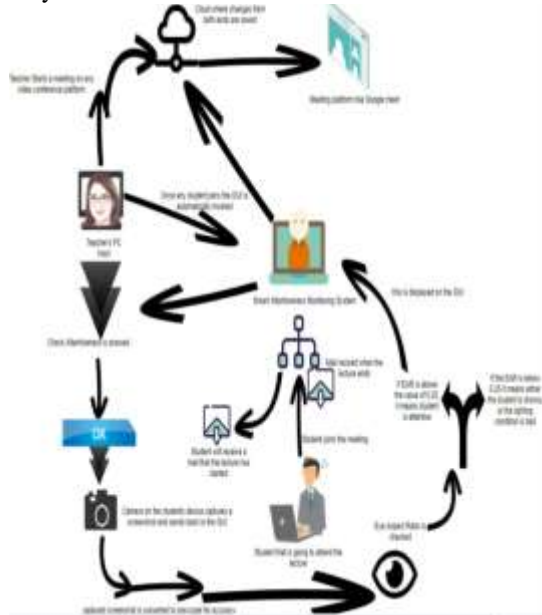


Fig-5 Flowchart

### VI. RESULTS

#### 6.1 output of the project



Fig-6: Output of the project

#### 6.2 Outputs sent to mail

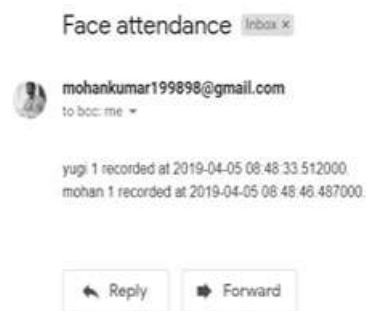


Fig-7: Output sent to mail

### VII. CONCLUSION

Our Project “Smart learning student monitoring” is designed to provide a way for students to be attentive and it also allows teachers to come up with a way to engage students in learning. Not only does it make it easier for teachers to monitor students that also alerts them of potential inattentiveness and it will help them to stay alert during classes.

Hence, we have accomplished to build up a solid and productive participation framework to

actualize an image handling algorithm to identify faces & also our program used in-built library functions like OpenCV, PIL but now we have custom train datasets through Haar Cascade Algorithm which will enable our final program to recognize faces of people and will differentiate it from other random pictures also. and provide better solid arrangement from each keen of time and security using face detection and recognition.

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