A

PROJECT REPORT

ON

"Automated System for Student Behaviour Monitoring in Classroom"

SUBMITTED TO

SHIVAJI UNIVERSITY, KOLHAPUR

IN THE PARTIAL FULFILLMENT OF REQUIREMENT FOR THE AWARD OF DEGREE BACHELOR OF ENGINEERING IN COMPUTER SCIENCE AND ENGINEERING

SUBMITTED BY

Yogesh Chillal	17UCS12004XX
Pratik Durukkar	17UCS12010XX
Swaranjali Magdum	17UCS11029XX
Shravani Narvekar	17UCS51035XX
Siddharth More	18UCS72008XX

UNDER THE GUIDANCE OF

Prof. K.S.KADAM

DKTE

Promoting Excellence in
Teaching, Learning & Research

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

DKTE SOCIETY'S TEXTILE AND ENGINEERING INSTITUTE, ICHALKARANJI

(AN AUTONOMOUS INSTITUTE)

ACCREDITED WITH 'A+' GRADE BY NAAC

An ISO 9001: 2015 Certified

SHIVAJI UNIVERSITY KOLHAPUR

2020-2021

D.K.T.E.SOCIETY'S

TEXTILE AND ENGINEERING INSTITUTE, ICHALKARANJI
(AN AUTONOMOUS INSTITUTE)
ACCREDITED WITH 'A+' GRADE BY NAAC

An ISO 9001: 2015 Certified

SHIVAJI UNIVERSITY KOLHAPUR

2020-2021

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

DKTE
Promoting Excellence in
Teaching, Learning & Research

CERTIFICATE

This is to certify that, project work entitled

"Automated System for Student Behaviour Monitoring in Classroom"

Is a bonafide record of project work carried out in this college by

Yogesh Chillal	**17UCS12004XX**
Pratik Durukkar	**17UCS12010XX**
Swaranjali Magdum	**17UCS11029XX**
Shravani Narvekar	**17UCS51035XX**
Siddharth More	**18UCS72008XX**

In the partial fulfillment of award of degree Bachelor in Engineering in Computer Science & Engineering prescribed by Shivaji University, Kolhapur for the academic year 2020-2021.

Prof. K.S.KADAM
(PROJECT GUIDE)

Prof.(Dr.) D.V.KODAVADE
(HOD CSE DEPT.)

Prof.(Dr.) P.V.KADOLE
(PRINCIPAL)

EXAMINER: _____

DECLARATION

We hereby declare that, the project work report entitled "**Automated System for Student Behaviour Monitoring in Classroom**" which is being submitted to D.K.T.E. Society's Textile and Engineering Institute Ichalkaranji, affiliated to Shivaji University, Kolhapur is in partial fulfillment of degree B.TECH.(CSE). It is a bonafide report of the work carried out by us. The material contained in this report has not been submitted to any university or institution for the award of any degree. Further, we declare that we have not violated any of the provisions under Copyright and Piracy / Cyber / IPR Act amended from time to time.

PRN	NAME	SIGNATURE
17UCS12004XX	Mr. Yogesh Chillal	
17UCS12010XX	Mr. Pratik Durukkar	
17UCS11029XX	Miss. Swaranjali Magdum	
17UCS51035XX	Miss. Shravani Narvekar	
18UCS72008XX	Mr. Siddharth More	

ACKNOWLEDGEMENT

With great pleasure we wish to express our deep sense of gratitude to Mr. K.S.KADAM for his valuable guidance, support and encouragement in completion of this project report. Also, we would like to take opportunity to thank our head of department Dr. D. V. Kodavade for his co-operation in preparing this project report.

We feel gratified to record our cordial thanks to other staff members of Computer Science and Engineering Department for their support, help and assistance which they extended as and when required.

Thank you,

Mr. Yogesh Chillal	17UCS12004XX
Mr. Pratik Durukkar	17UCS12010XX
Miss. Swaranjali Magdum	17UCS11029XX
Miss. Shravani Narvekar	17UCS51035XX
Mr. Siddharth More	18UCS72008XX

Abstract

Now a days with increasing advancement in the field of technology we are more attracted towards the automated systems. We find automated system as a solution for most of the problems. Therefore, we came up with the automated system for student behaviour monitoring in classroom. This system capture and make a summary of student behaviour in the classroom. It is the responsibility of the faculty to ensure the smoothness of the classroom activities alongside with monitoring the students' attendance, attention, and activities like entering or leaving the classroom. Manual observation on these could affect the teaching and learning process of the faculty and students and causes the distraction from the main syllabus. The system records the entire session and identifies when the students pay attention in the classroom, and then reports to the facilities. Student's performance can be recorded and the data can be used for continuous assessment in the future

INDEX

Introduction:

Problem definition:

Teaching and learning process are often considered as the most significant activity in an educational institute. During classes, the faculty takes the responsibility of monitoring attendance and the behaviour of the students alongside with the teaching activity. However, manually taking the attendance and monitoring students in a class can be a time consuming job and this directly affects the teaching and learning process.

Furthermore, students' misbehaviour might make the situation worse such as not concentrating, playing mobile phone, moving around, and sneaking out from the class. Teachers can grasp the bad attitudes of students, they will make more reasonable adjustments to vary the educational environment for the students. The teacher can track student behaviour by observing and questioning them in the classroom. This process isn't difficult during a classroom that has few students, but it's an enormous challenge for a classroom with an oversized number of students.

We know that Automated learning analytics is becoming an essential topic in the educational area, which needs effective systems to monitor the learning process and provide feedback to the teacher therefore, to keep the track of students' behaviour within the classroom we thought of developing an automated system that will mark the attendance and monitor the behaviour of students. This will help the teachers to focus on the main syllabus and students to concentrate on studies. With the results that we obtain from the system can be used by the faculty to analyze what number of students are really interested in the subject. Depending upon the analysis the faculty can make changes in the subject syllabus as well as the teaching methods so that a maximum number of students are enthusiastically involved in the learning process. Therefore, our system will overall improve the teaching and learning process.

Aim of the project:

The aim of our project is to develop an Automated System for Student Behaviour Monitoring in Classroom. An automated application for generating detailed reports of students' behavioural and attendance in the classroom from student activities during lectures.

Many factors affect a student's academic performance. Student achievement depends on teachers, education programs, learning environment, study hours, academic infrastructure, institutional climate etc. Another extremely important factor is the learner's behaviour. Major constructs of study behaviour, including study skills, study attitude, and motivation, to have strong interaction with students' learning results. Students' perceptions of the teaching and learning environments influence their study behaviour. This means if teachers can grasp the bad attitudes of students, they will make more reasonable adjustments to vary the educational environment for the students. To conclude whether good or bad behaviour for a particular student is not an easy problem to solve, it must be identified by the teacher who has worked directly in the real environment. To overcome this situation our aim is to develop an automated system.

We know that Automated learning analytics is becoming an essential topic in the educational area, which needs effective systems to monitor the learning process and provide feedback to the teacher to keep the track of students' behaviour in the classroom. Our aim is to develop an automated system that will mark the attendance and monitor the behaviour of students.

Objectives of the project:

The objective is to build an automatic system that allows the faculties to capture and make a summary of student behaviour in the classroom as a part of data acquisition for the decision making process. The system records the whole session and identifies when the students concentrate within the classroom, then reports to the facilities.

There are mainly 2 objectives of our project:

1. To detect faces and recognize them for attendance.

The objective is to detect the faces present in the classroom and recognize them. Also to maintain the attendance of the students. Taking the attendance manually is a time consuming process and sometimes students may involve in making proxy attendance. Therefore this objective will help in taking the attendance in an efficient manner without any misleading.

2. To detect students' attentiveness and behaviour in the classroom during lectures.

The objective is to track the eyes of the students to check if the student is looking at the board or towards the teacher or is busy on the mobile phone or other unnecessary things. Depending upon the time for which the student is looking at the board or other things his/her behaviour is analyzed. If the student is busy on a mobile phone or sleeping for maximum time in the lecture duration his/her behaviour alert will be shown to the faculty. This objective will help the faculty to think on the matter and take necessary actions.

Also the objective is to generate the report. Attendance of each student obtained from the first objective will be used to calculate the overall attendance of the student and accordingly alert the faculty about the attendance of the student. Also the second second objective output will help in analyzing performance of the student. Together both the objectives will help the teachers to take the necessary actions and also students to concentrate on studies during the lecture.

Scope and limitations of the project:

In today's attendance system, faculty goes down the class list and visually verify that all children are accounted for particular lecture and marks the attendance manually. Even though it is the right way, it is not efficient to large classroom and large number of students. Also, for the single professor it is hard to look after each and every student's behaviour during the lectures.

Thus, our idea is to automate this method in which the system will automatically mark the attendance of the students and also monitor the activities of the student during the lectures.

Our System will capture the picture and it will recognise each face and labels it with their name. Then, the system will display the list of present student names with the count of total students. It will also display whether the students are active or inactive during the lectures..

This approach will help the faculty of every school and college which has big classrooms and large number of students to take the attendance of students. And can be also useful to focus on the teaching part as our system will monitor each and every student's behaviour.

Along with some improvements we will use such system in many online platforms, it will helpful for online platform to generate reports for the teaching organizations.

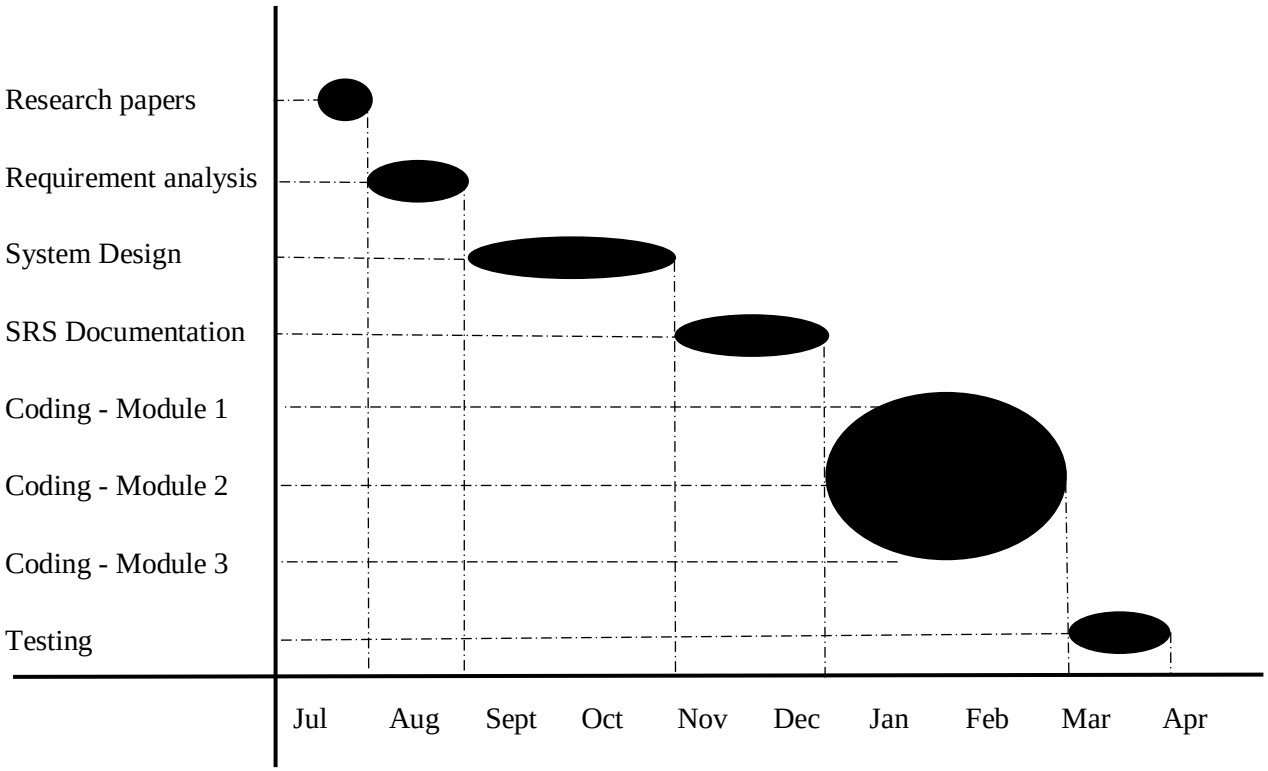
Online teaching platforms can also use such system for the attendance and the behaviour analysis helps them to measure how well they are doing.

Limitations:

1. As we are towards the online world, online class will be the future and our system may not work with online platforms.
2. Each and every student should be registered separately in the system.
3. If the student's face hides behind other student or if face is covered, then the attendance will not be marked.

Timeline of the project:

We started the project by gathering the related documents to the project at the end of July 2020. Gathering the requirements and all the analysis tasks was done by mid of August 2020. After that System design was started in the month of September 2020 and completed by the start of November along with the UML diagrams and Synopsis with rough idea of the project. In November 2020 we started making the detailed SRS documents along with deciding the methodology for the project which was completed by mid-December 2020. By the start of January 2021 we started coding by dividing it into 3 modules and completed the 1st module by mid-January 2021. Other two modules were completed by the end of February 2021. By the end of March 2021 we started testing the project alongside designing the GUI which was completed in the first week of April 2021.



Background study and literature overview:

Literature overview:

In an article published online in The Guardian, one of the authors asked the question: "Are lectures the best way to teach students?" In the beginning of the article, they start with lecture halls and lectures, describing their darkness, endless PowerPoint slides, and the distraction of students themselves and others when browsing the web and social networks. In such a scenario, it is crucial for lecturers to recognize indications of students' loss of attention to respond with appropriate methods. Traditional lectures conducted in classrooms are the predominant teaching paradigm since medieval universities. Critics point out the one-to-many method of communication of lectures assigning students a passive role.

In a study it was found that attention breaks do appear to exist and occur generally throughout lectures. It was also observed that after about 15 minutes a lecture started, 10 percent of the audience showed signs of inattention. It was reported that the number of students paying attention begins to drop dramatically with a resulting loss in retention of lecture material, which is noticeable that immediately after the lecture students remembered 70 percent of information presented in the first ten minutes of the lecture and 20 percent of information presented in the last ten minutes. Another survey written in the study showed that 71% of teachers thought technology damaged students' attention. And 64% people who took another survey said that technology did more to distract students than to help them academically

To overcome this problem in the universities many came forward to provide a solution. Most of them could not find the proper solution and solutions could not work as students found out another alternative to escape from the built solutions.

Investigation of current project and related work

Lot of people are working in this field to find the solution for teaching and learning problems. Many of them came up with good paper work for the problem but few were not that practical to implement into a classroom and real environment. Some of them came with really heavy and costly solutions which required technical skill and also extra human power to implement in a university or school. Here are some examples of the papers that proposed the solution**.**

Visualization Analysis of Learning Attention Based on Single-image.

College of Information Science and Technology, Beijing Normal University, 19 Xinjiekouwai Street, Haidian, Beijing, 100875, P. R. China

This paper proposed the technique of real time capturing the image of the classroom and checking whether the students are paying attention in the lecture by estimating the head pose of each student. This was done using Machine learning algorithms. Initially this solution seemed to be working, but later they came to know that only head pose estimation will not work as students may just keep their head up towards the camera while taking the image and later do anything they want. Deciding the attentiveness using a single image was not the proper solution. This technique could only estimate the head pose of the student and could not determine which student is attentive and which is not. Due to it's this limitation this could not work.

Automated Classroom Monitoring With Connected Visioning System.

Faculty of Computing and Information Technology Tunku Abdul Rahman University College, Setapak, Malaysia.

This paper proposed the technique of using IoT technology. They used the items embedded with electronics, software, sensors, to the network which enable these objects to collect, exchange, and analyze the data. This technique of using the IoT framework helped to find the solution for the problem. It involved recognizing the faces of students and then estimating the motions like determining if one is entering or leaving the classroom. This consists of three main functions, which are body detection, motion tracking and motion recognition. However this module worked very efficiently but the amount of resource and human power required was more.

Classquake: Measuring students' attentiveness in the classroom

Technische Universitat Darmstadt ¨ Dept. of Computer Science Hochschulstr. 10 64289 Darmstadt, Germany.

This paper proposes the app named Classquake which should be installed on the mobile phone of the students. This app uses students' smartphones as decentralized sensors to measure their activity and attentiveness during lectures. As the students use their mobile phones most of the time during the lecture this app will help to know the time for which the students are busy on the mobile phone. However this could only determine the use of mobile phones in the classroom and is not the proper solution for the problem. We will not be able to find the student who is using the mobile phone.

Sleep Gesture Detection in classroom monitor system

Department of Computer Science and Engineering, Shanghai Jiao Tong University, China

This paper proposes the technique of using the images of students sleeping in a classroom as a dataset and then training the model for detecting the sleeping students in a real classroom. They will make use of cameras in the classroom and capture the images of the students sleeping and later inform the faculty about it so that the faculty can later take proper action on the student. This method is the same as doing everything manually. There is no automated system for this purpose. As everything must be done manually it is more time consuming and not that worth.

Now coming to the conclusion from the above four papers that some of the systems proposed are useful but have drawbacks. As published in the 1st paper, estimating the head pose will not help in determining a particular student. Also the 2nd paper used the IoT framework with a lot of resources making it a complex solution. The 3rd paper making the use of the app will only provide the analysis. And finally in the last paper most of the task is done manually instead of automatic. Considering all the above solutions we came up with a new effective solution. This system will take the attendance as well as check the attentiveness of the student automatically. Also generate a report of the students who were present and who were active and inactive. Our proposed solution is fully automated and does not require a lot of resources.

Requirement analysis:

Software requirements:

- Windows 7 or later with MS office.
- SQL Server.
- Python programing language.

Hardware requirements:

- Processor - Intel core i5 or later
- 64 bit OS
- RAM - Minimum 4GB
- Secondary storage - Minimum 8GB
- Camera - Minimum 2MP

Functional Requirements:

RS1: The system should provide database to store login credentials. This will store the registration data entered by faculty.

RS2: The system should have a login. A login box should appear when the system is invoked

RS3: The system should crosscheck entered details. To crosscheck the entered details with the details present in the database.

RS4: System should inform about wrong login. System should be able to inform the user when wrong login id or password is entered.

RS5: The system should provide a database to store the images of student's face. This will help in identifying the student's face.

RS6: The system should detect and recognize the face of the students. When the student's image /video is seen by the system it will mark the attendance.

RS7: System must perform eye gaze tracking. This will check if the student is not sleeping.

RS8: System should recognize the student who was sleeping. Helpful to mark the behavior.

RS9: System should calculate the attendance and make behavioral analysis of student. This will give the behavioral analysis of all the students.

RS10: System should provide database to store the attendance and behavioral analysis. Helpful in keeping the record of the students.

RS11: System should generate report. To make the proper decisions on students as well as teaching techniques.

Nonfunctional requirements:

RS1: System should store sufficient images of students to recognize their faces.

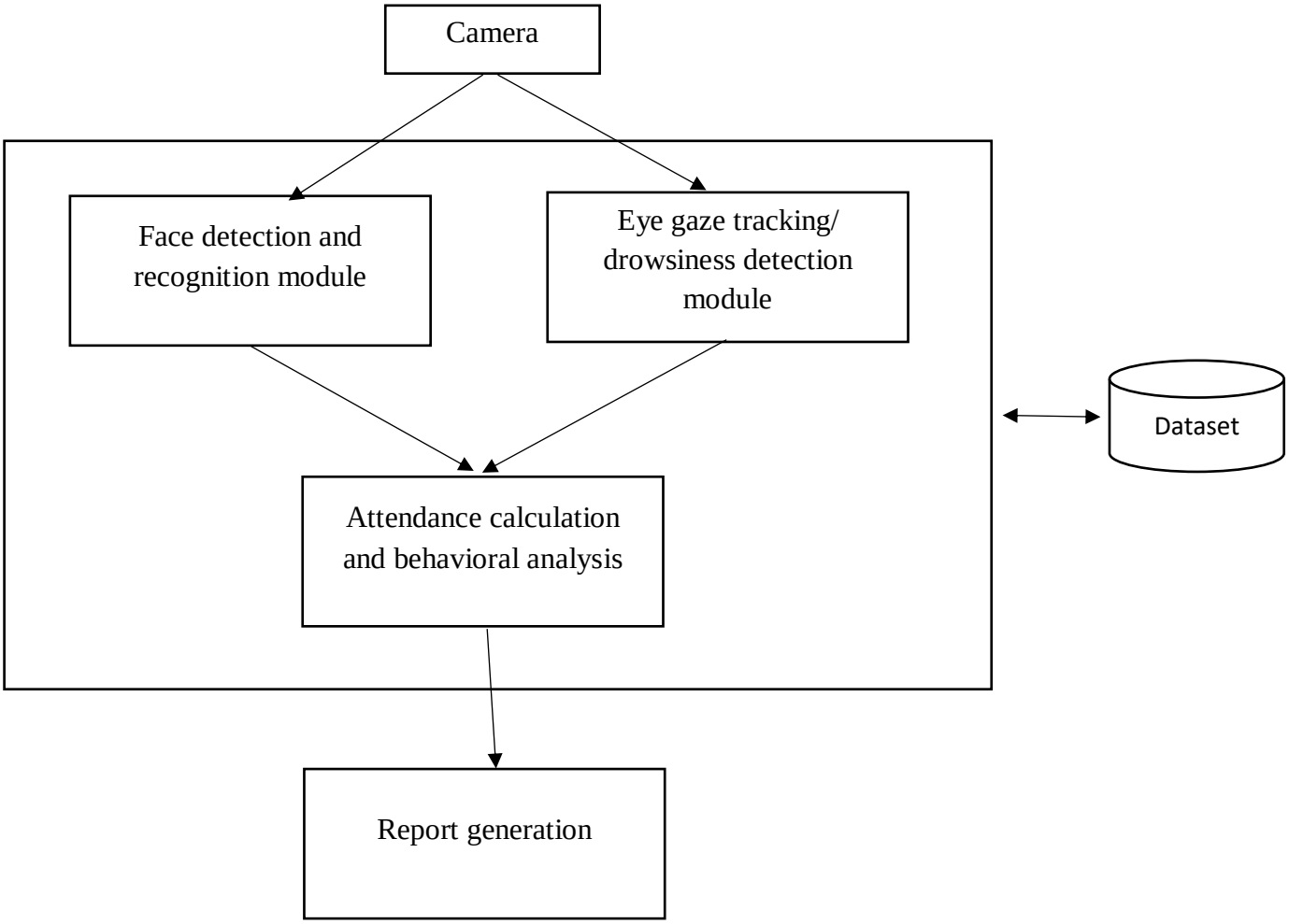
RS2: System should identify right student with right name. (Labeling of image with name must be done correctly)

RS3: Attentiveness must be displayed in proper time and if inactive for particular time period then system must mark inactive to that student.

RS4: Report must be generated with proper date and time.

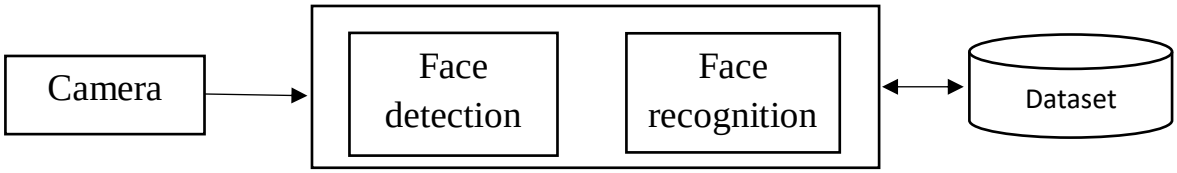
System design:

Architectural Design:



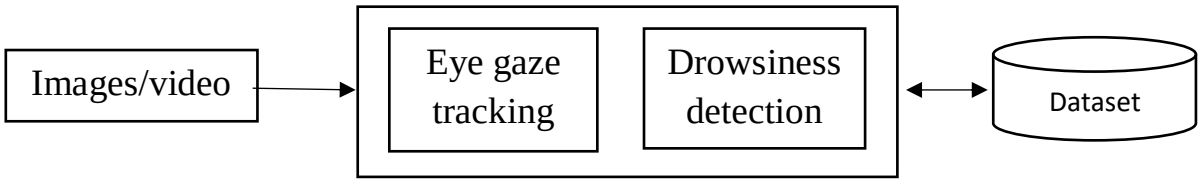
Algorithmic description of each modules:

Face detection and recognition module:



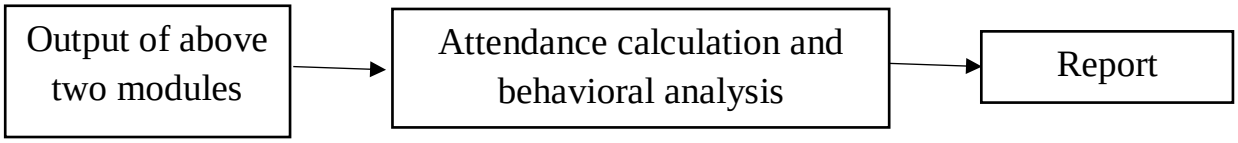
This module will capture the images/video of the students with the help of camera. These images/video will be used to detect the faces and recognize them with the help of Dataset labeling of image and name of the student can be done.

Eye-gaze tracking/ drowsiness detection module



This module will use the images/video captured form above module and then perform eye gaze tracking along with drowsiness detection. There is a dataset provided because this will again help in mapping or labeling the image and name of the student from above module.

Behaviour analysis module:



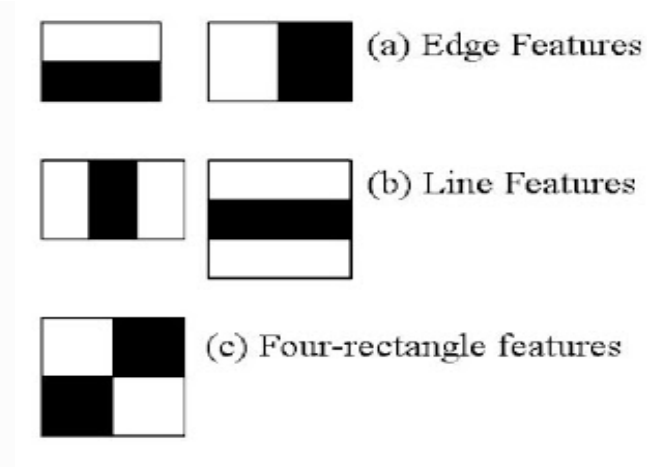
This is the last module where the output from 1st two modules will be used to mark the attendance and calculate the behaviroul analysis.

System Analysis:

We have performed Object Detection using Haar feature-based cascade classifiers. Basically it works in flow of:

- Calculating Haar Features
- Creating Integral Images
- Implementing Cascading Classifier

Initially, the algorithm needs tons 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 within the below image are used. Each feature is a single value obtained by subtracting the sum of pixels under white rectangle from the sum of pixels under black rectangle.



This step involves large calculations to find out features from an image. To solve this computational problem integral image concepts are introduced. Integral images speed up the calculation of those Haar features. Instead of computing at every pixel it creates sub rectangles in a given window, for each feature will find the best threshold which classifies the faces to positive and negative.

In a picture, most of the region is a non -face region. So it is better to have a simple method to check if the window is not a face region. If it is not a face region, discard it in a single shot. Don't process it again. Instead target the region where there can be a face. This way, we will find more time to see a possible face region.

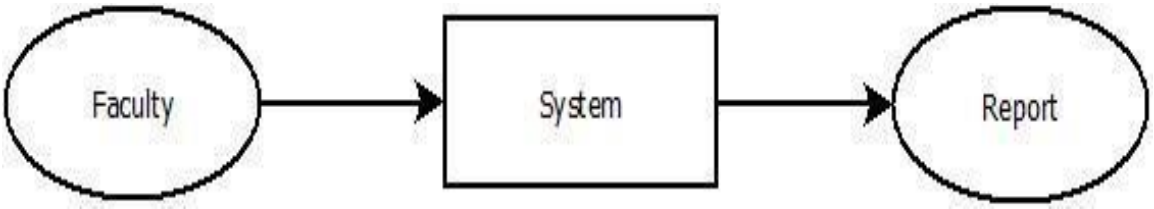
In a cascade classifier rather than applying all the features together on a window, group the features into different stages of classifiers and apply one-by-one. If window fails in first stage discard it. Then no need to consider remaining features on it. If it passes, apply the next stage features and continue the process. Finally the window which passes all the stages is a face region.

System Modeling:

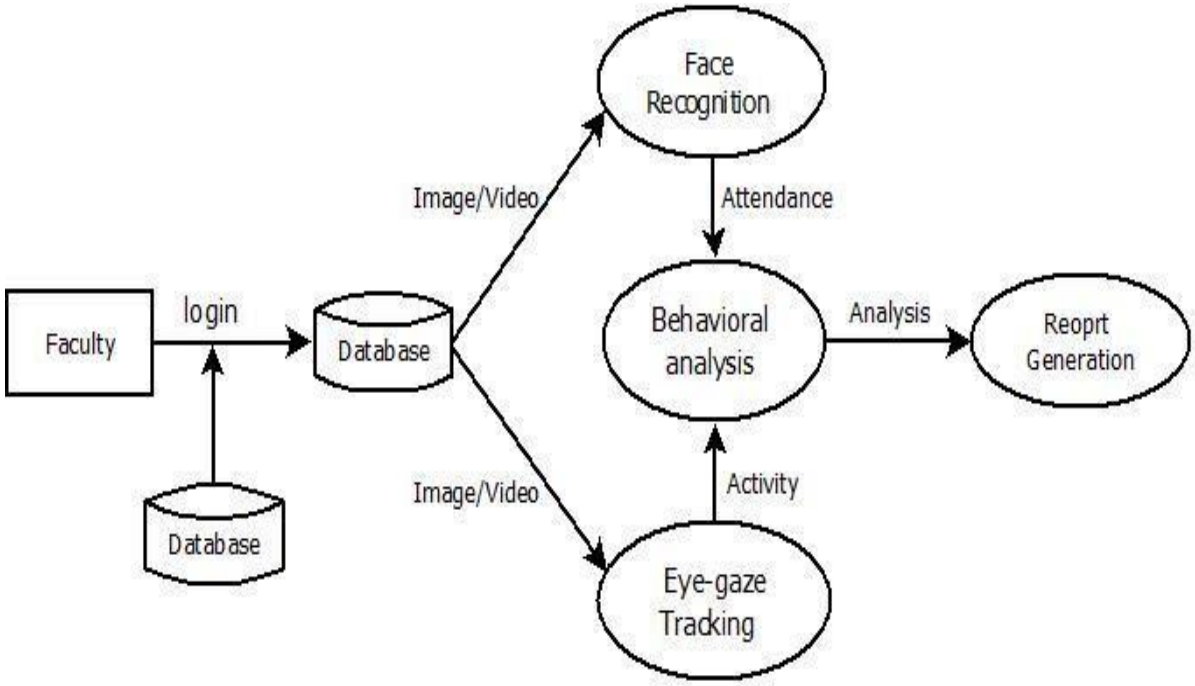
The purpose of system modelling is to visually representing a system along with its main actors, roles, actions, artifacts and flow of data from one source to another in order to better understand the system

1. Data Flow Diagram:

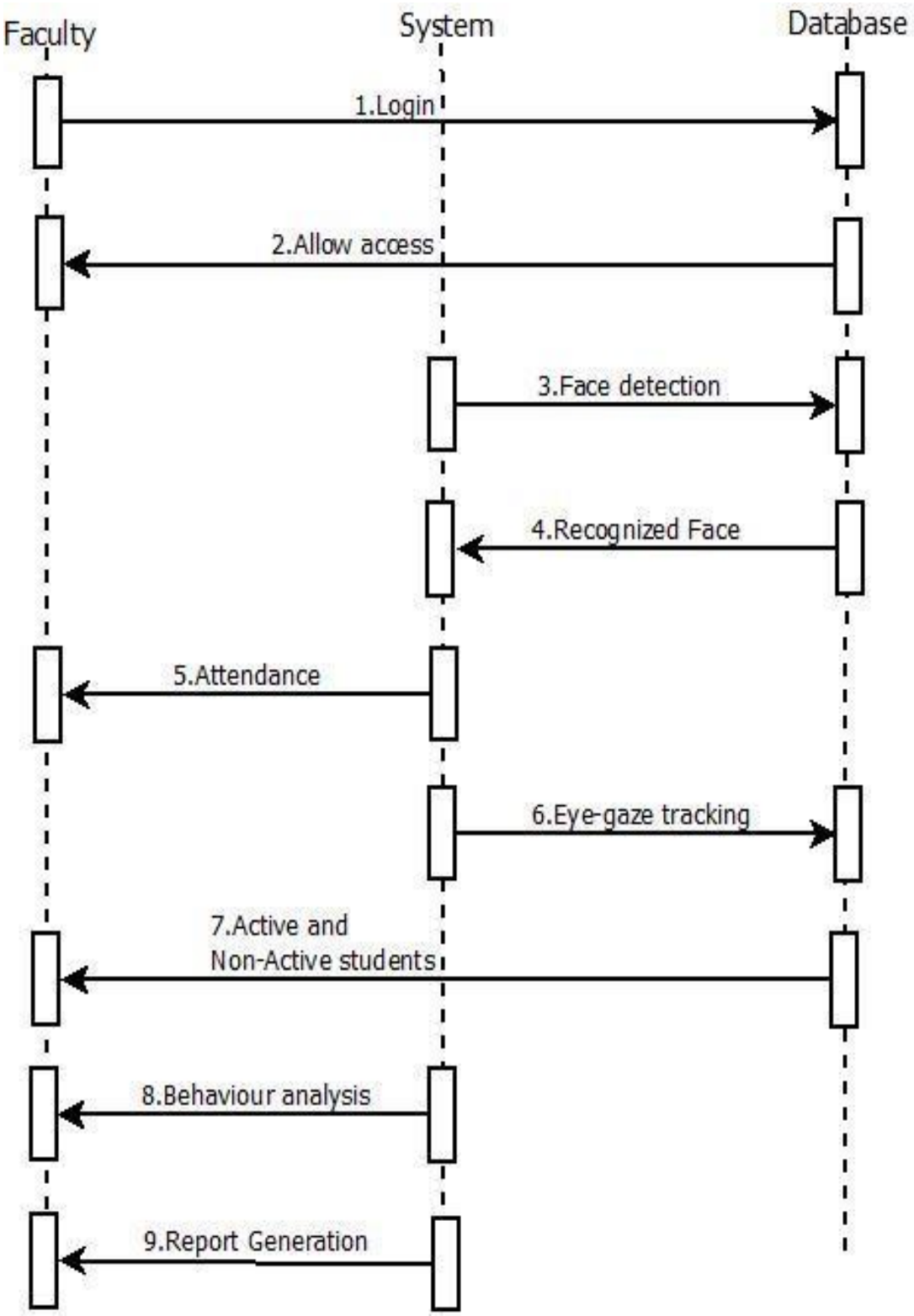
Level 0:



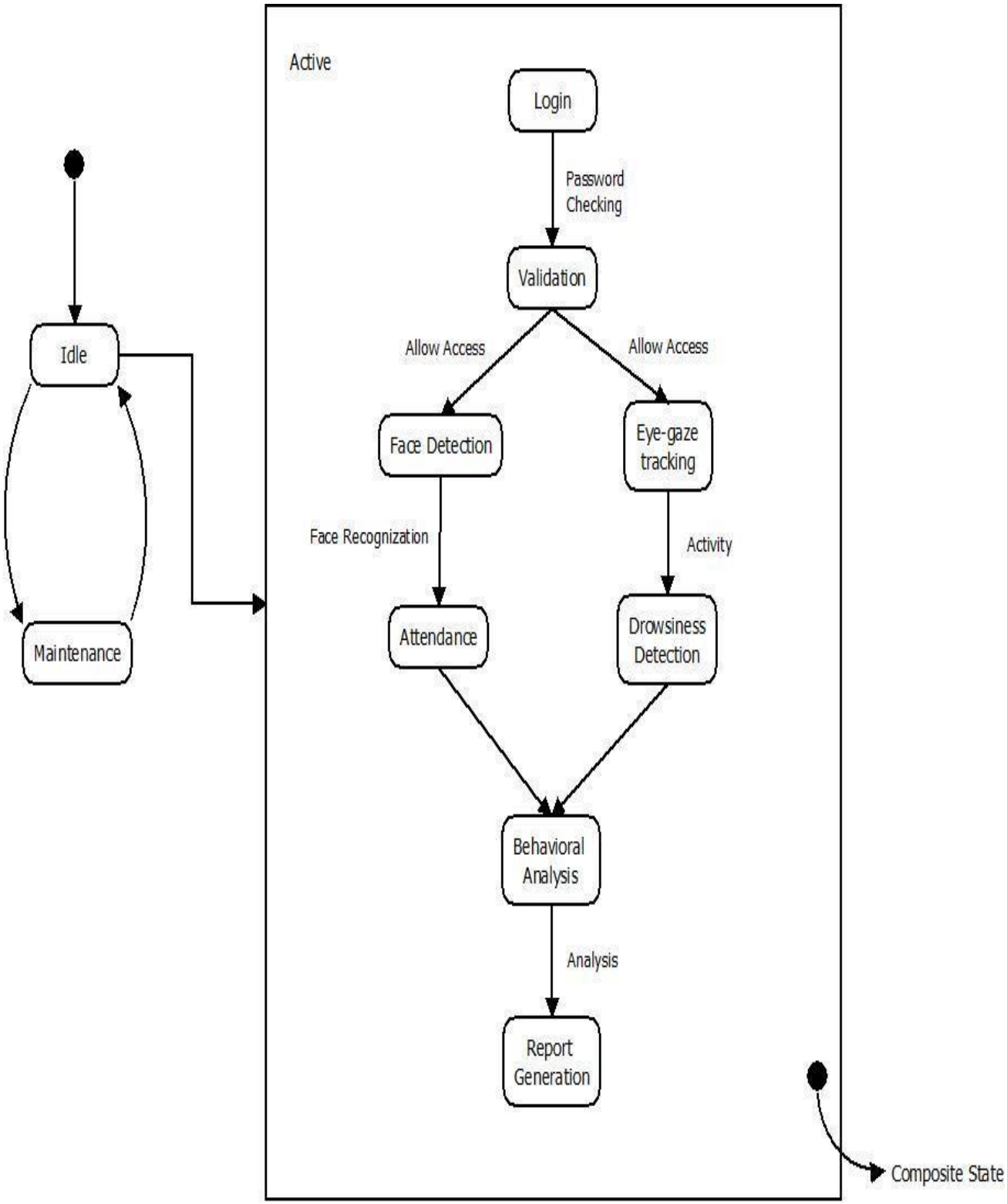
Level 1:



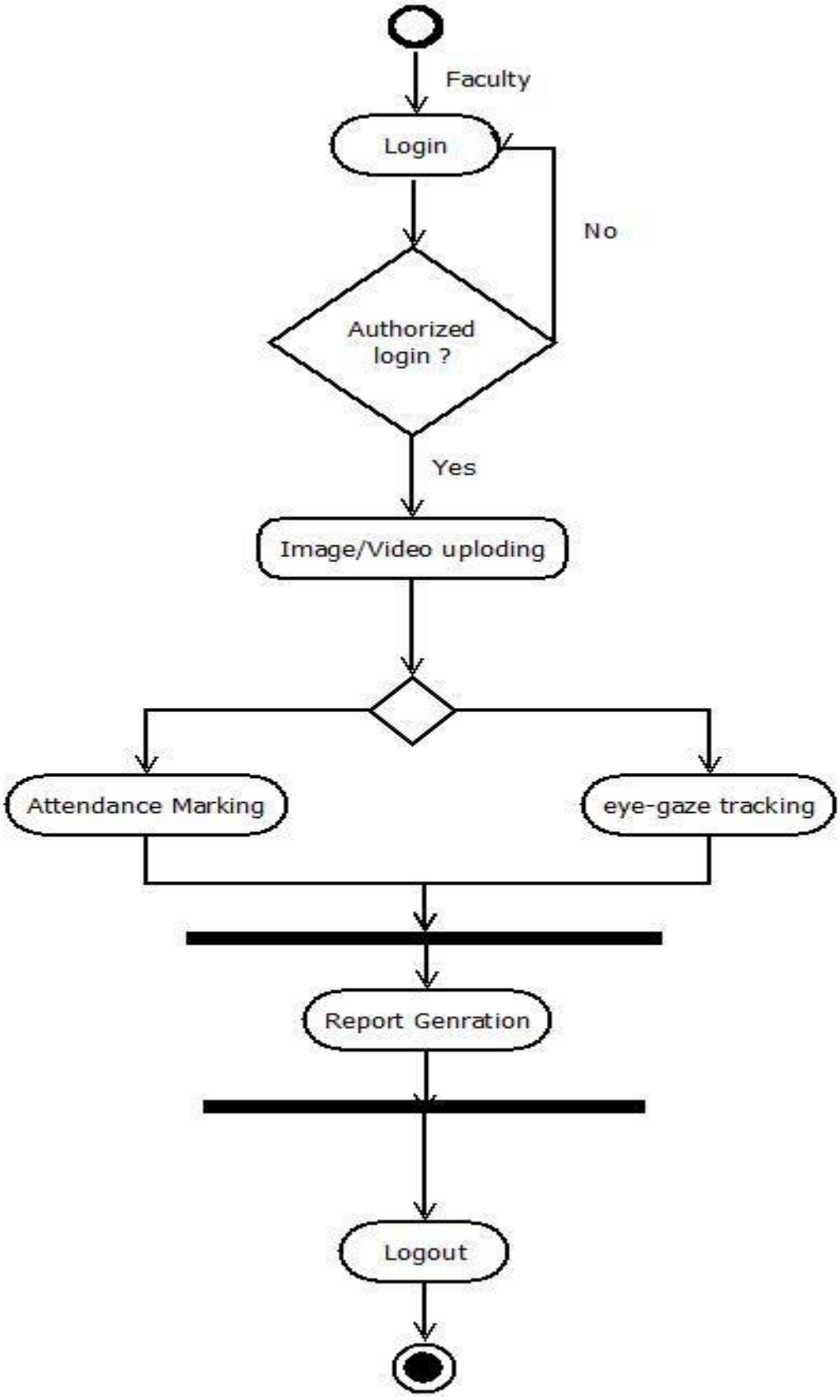
2. Sequence Diagram:



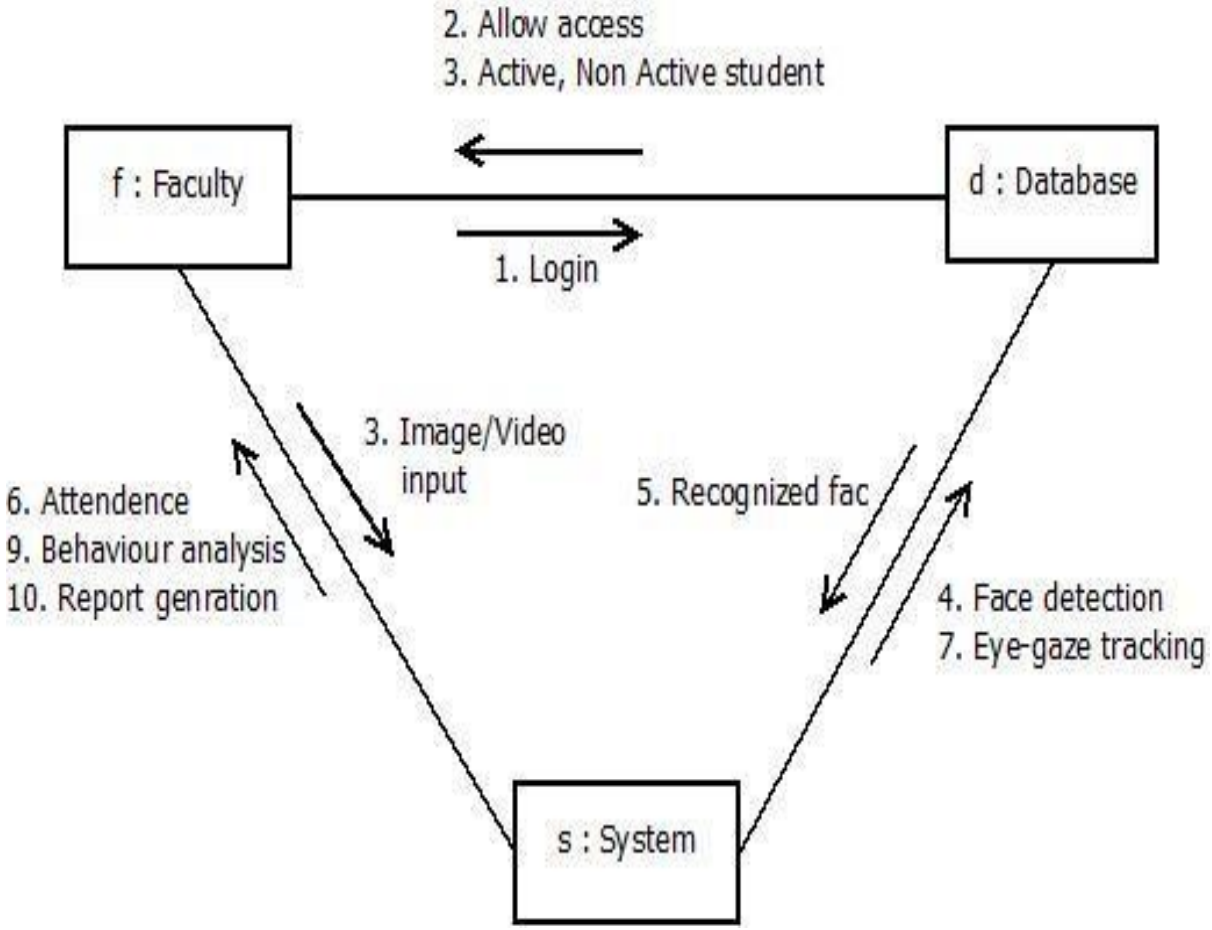
3. State Chart Diagram



4. Activity Diagram:



5. Collaboration Diagram



Implementation:

Implementation details for Registration of student:

First of all we need to register a student so that we can detect and recognize the student for the attendance and monitoring the behaviour in class. Registration is the process of taking the image along with the name of the student and store it into the database. This will help the system to detect and recognize the students in the class that is labelling the output image or video with the input name and image as we used while registration. Registration will help in improving the efficiency of the system and will be user friendly to generate the report of attendance and monitoring the behaviour. Also registration is done to make a list of the known students in the classroom.

In this system for registration of the student we take the name of student and then the image of the student. For this purpose we used modules such as OS module and CV2 module.

The **OS module** provides functions for interacting with the operating system. The **os.path** module include many functions to interact with the file system.

OpenCV is a cross-platform library using which we will develop real-time computer vision applications. It mainly focuses on image processing, video capture and analysis including features like face detection and object detection.

At first we need to define the path where we want to store the images and names of the registered students. Then we need to add another directory for the new registration. With the help of **os.path.join** () method we merged the main directory where all the registered students are present with the new registration. Here we can check if the student is already registered or not. For this we use **os.path.isdir ()** method which is implied to examine whether the new registration is an existing directory or not. If the student is not already registered then we create the new directory with the name of the student. **os.mkdir ()** method is used to create new directory.

Next step is to store the images of the student in that directory. With the help of OpenCV we can capture the image/video from the camera. **VideoCapture ()** method is used to get a video capture object form the camera. Now we use **read ()** method to read the frames using the above created object and **imwrite ()** method is used to save an image in the directory. Further **imread ()** and **imshow ()** methods are used to load the image and show the image

respectively. Thus we can say now the registration of the student is completed and with the help of face detection and recognition technique we can mark attendance.

Implementation details for Face detection and recognition:

Here we are giving this solution to achieve our first objective that is to mark attendance automatically by using image processing technique. For this first system should recognize the faces from input. Face recognition module consists of three main steps which are image pre-processing, then face detection can be done by using suitable algorithms and last one face recognition.

For face detection purposes we need to take input as an image or video. By using the method VideoCapture.read () input can be taken. For face detection we need to import cv2 and numPy. After importing and taking input, the next step is to convert that RGB image into gray scale and for this purpose we have used the cv2.cvtColor () method .Generally the images are in the form of RGB format (Red, Green, Blue). So, when OpenCV reads the RGB image, it usually stores the image in BGR (Blue, Green, Red) Format. RGB to grayscale conversion is done because it is easy to process and is computationally less intensive as it is converted from 3d matrix to 2d matrix.

```
Gray = cv2.cvtColor (frame, cv2.COLOR_BGR2GRAY)
```

In this method we have to pass two arguments first one is the input object and second one is COLOR_BGR2GRAY.

Now after converting the image from RGB to Gray, we will now attempt to locate the exact features in our face. Here is the code:

```
Faces = face_classifier.detectMultiScale (gray, 1.5, 5)
```

In this piece of code what we are trying to do is, using the **face_classifier** which is an open framework application. Which rapidly trains a classifier to recognize facial expressions. We are using an inbuilt function with it called the **detectMultiScale.** This function will help us to seek out the features/locations of the new image. The way it does is, it will use all the features from the **face_classifier** object to detect the features of the new image. The parameters that we will pass to the present function are:

1. The gray scale variable — gray in in this case

2. **scaleFactor —** Parameter specifying what proortion the image size is reduced at each image scale. Basically, the scale factor is used to make your scale pyramid. More explanation, model has a fixed size defined during training, which is visible within XML. This means that this size of the face is detected within the image if present. However, by rescaling the input image, you can resize a bigger face to a smaller one, making it detectable by the algorithm. 1.05 is a good possible value for this, which means you use a small step for resizing, i.e. reduce the size by 5%, you increase the chance of a matching size with the model for detection is found. This also means that the algorithm works slower since it is more thorough. You may increase it to as much as 1.5 for faster detection. In our case, I have used 1.5 as the **scaleFactor.**

3. **minNeighbors** — Parameter specifying how many neighbors each candidate rectangle should have to retain it. In this case, we have taken 6 as the **minNeighbors**.

From the above step, the function **detectMultiScale** returns 4 values — x-coordinate, y-coordinate, width(w) and height(h) of the detected feature of the face. Based on these 4 values we will draw a rectangle around the face.

```
For (x,y,w,h) in faces:

cv2.rectangle (cv2image,(x,y),(x+w,y+h),(0,0,255),2)
```

After detection of face from input (which is either image or video), Next task is to recognize the faces from input which important step to achieve both of objectives of our project.

A lot of face recognition models are available in open source as well. In this particular task one such python library named face_recognition is used to recognize faces from input.

This library works in few steps:

- Identify a face in given image
- Identify specific features in the face
- Then generate a face encoding vector of 128 values.

Based on this encoding, one can measure similarity between two face images that can determine if they belong to the same person or not.

Here are the steps to achieve face recognition:

First thing is to install face recognition module by using following command:

Pip install face_recognition

Import face_recognition

The output of face detection is nothing but input in face recognition if face is detected. After cropping the image have convert in an array of size 128:

```
Lastimg  = cv2.resize(faceimg, (128, 128))
```

Face_loaction method returns four points which are measurements of image top, right, left, bottom used following line of code:

```
Boxes= face_recognition.face_locations (lastimg.model = args ["detection_method"])
```

For face recognition, the algorithm notes certain important measurements on the face just like the color and size and slant of eyes, the gap between eyebrows, etc. All these put together define the face encoding the information obtained out of the image that is used to identify the actual face. To create encoding we used:

```
encodings = face_recognition.face_encodings(lastimg, boxes)
```

After that need to compare the current encoding with the encoding which created at the registration time. It can be done by using following:

```
matches = face_recognition.compare_faces(data["encodings"], encoding)
```

If matches are found then just append that matched name into the list.

Implementation for Eye gaze tracking:

Here we are giving this solution to achieve our second objective that is to check what amount of period student attend the lecture with full attention or without any misbehaviour by using eye aspect ratio (EAR). This system should recognize the faces from input.

Eye gaze tracking module consists of three main steps which Eye localization, Thresholding to find the white spaces of the eyes, determining if the “white” region of the eyes disappears for a period of time and can be done by using eye aspect ratio.

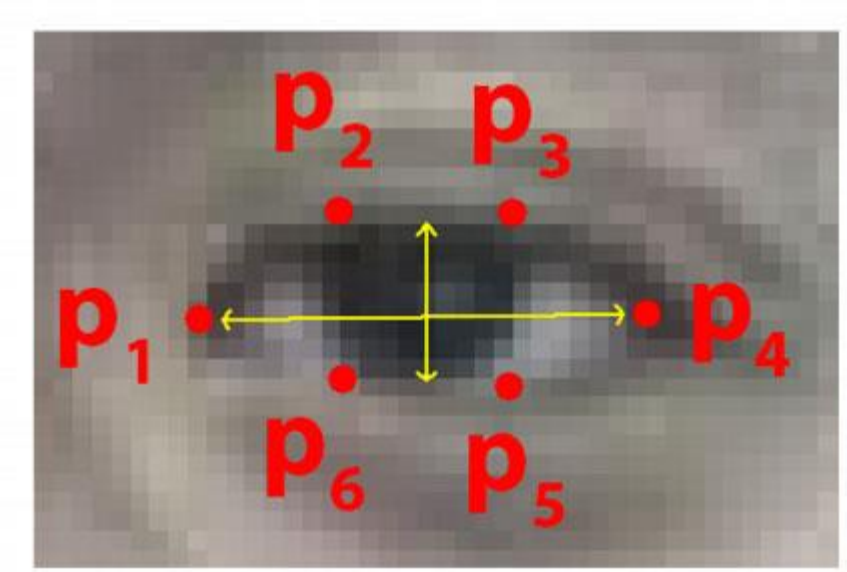
Understanding of Eye aspect Ratio (EAR):

The eye aspect ratio is instead a much more elegant solution that involves a very simple calculation based on the ratio of distances between facial landmarks of the eyes.

This method for eye blink detection is fast, efficient, and straight forward to implement. This also implies that we can extract specific facial structure by knowing the indexes of the particular face parts:

In terms of blink detection, we are only curious about two sets of facial structures — ***the eyes.***

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:



To localize of facial landmark from the video input face_utils.
FACIAL_LANDMARKS_68_IDXS used

(lStart, lEnd) = face_utils.FACIAL_LANDMARKS_68_IDXS["left_eye"]

(rStart, rEnd) = face_utils.FACIAL_LANDMARKS_68_IDXS["right_eye"]

For calculating eye aspect ratio here we create the method that takes the input as the shape of above facial landmark of eye. For both left and right eye landmark EAR is calculated separately.

```
def eye_aspect_ratio(eye):

leftEye = shape[lStart:lEnd]

rightEye = shape[rStart:rEnd]

leftEAR = eye_aspect_ratio(leftEye)

rightEAR = eye_aspect_ratio(rightEye)
```

In this above EAR method we actually calculate the eye aspect ratio by using equation of EAR.

Based on the work by Soukupova and cech in their 2016 paper, Real-Time Eye Blink Detection using Facial Landmarks, we can then derive an equation that reflects this relation called the *eye aspect ratio* (EAR):

$$\text{EAR} = \frac{\|p_2 - p_6\| + \|p_3 - p_5\|}{2\|p_1 - p_4\|}$$

Where *p1, …, p6* are 2D facial landmark locations.

The numerator of this equation computes the distance between the vertical eye landmarks while the denominator computes the distance between horizontal eye landmarks, weighting the denominator appropriately since there is only *one* set of horizontal points but *two* sets of vertical point. Above equation is used as follows for the both eye that are the input for the EAR method

```
A = distance.euclidean(eye[1], eye[5])

B = distance.euclidean(eye[2], eye[4])

C = distance.euclidean(eye[0], eye[3])

ear = (A + B) / (2.0 * C)

return ear
```

Above return output as EAR for left or right eye. Then for both eyes new EAR is calculated as

```
ear = (leftEAR + rightEAR) / 2.0
```

If calculated EAR for both eyes is less than the threshold value (i.e. 0.25) then function return that the student is not active or active if EAR is greater than the threshold value. Well, as we'll find out, the eye aspect ratio is approximately constant while the eye is open, but will rapidly fall to zero when a student closes eyes.

Using this simple equation, we can avoid image processing techniques and simply rely on the ratio of eye landmark distances to determine if a person is blinking.

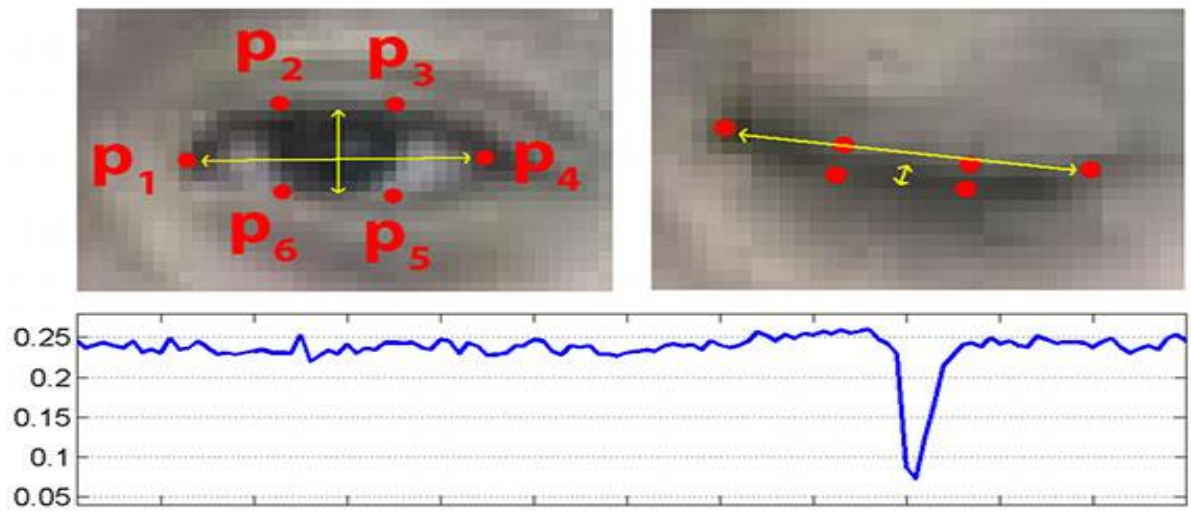


Fig. *Top-left:* A visualization of eye landmarks when then the eye is open. *Top-right:* Eye landmarks when the eye is closed. *Bottom:* Plotting the eye aspect ratio over time. The dip in the eye aspect ratio indicates eyes closed

On the *top-left* we have an eye that is fully open — the eye aspect ratio here would be large(r) and relatively constant over time. However, once the person blinks (*top-right*) the eye aspect ratio decreases dramatically, approaching zero. The *bottom* figure plots a graph of the eye aspect ratio over time for a video clip. As we can see, the eye aspect ratio is constant, and then rapidly drops close to zero, then increases again, indicating a single blink has taken place.Student is "active or not active" is the final output of the eye gaze tracking module is provided as input to behavioural analysis module.

Implementation for Report generation:

As we have to show the final output of the Attendance and Behaviour as the Report of Students it contains the following points: date.today ()

We imported the date class from the **datetime** module. Then we used the **date.today ()** method to get the current local date. It returns a date object, which is assigned to the "now" variable.

txt.get('1.0',END)

This method reads the data that is stored in act variable, from the first char till end as "1.0" mean Line 1, first char. Similarly END is the string end including the line break.

To get the length of string len() is used which will return the length of names stored in array, whose result will be stored in "count" variable.

Attendance=open (str(now)+" "+ str (Ctime)+".txt",'a')

The new file is opened with the current local time as Attendance and it contains the count of total number of students present in the classroom. It also contains the names of present student in the file. Each name is given a unique number to identify them separately. Then the names are labelled for each student face recognition. This all process of Attendance is done using Attendance.write () method which writes the specified text to the file

Next, the Messagebox.showinfo () is used to show some relevant information to the user. It basically displays the message that Attendance is taken successfully. The file also states the student activities during the lectures. First, it shows the text as "Student activity:" and the activity is shown as either active or inactive.

Example :(Only for 1 student)

Total Number of Students Present is: 1

Present Student:

1. Pratik Durukkar

Student activities:

Pratik Durukkar is Not Active

Here, the count is shown and attendance is marked also the eye gazing method records the behaviour of the student and accordingly the activity of the student is stated in the report of Students Also the message box occurs if something wrong happens in the system.

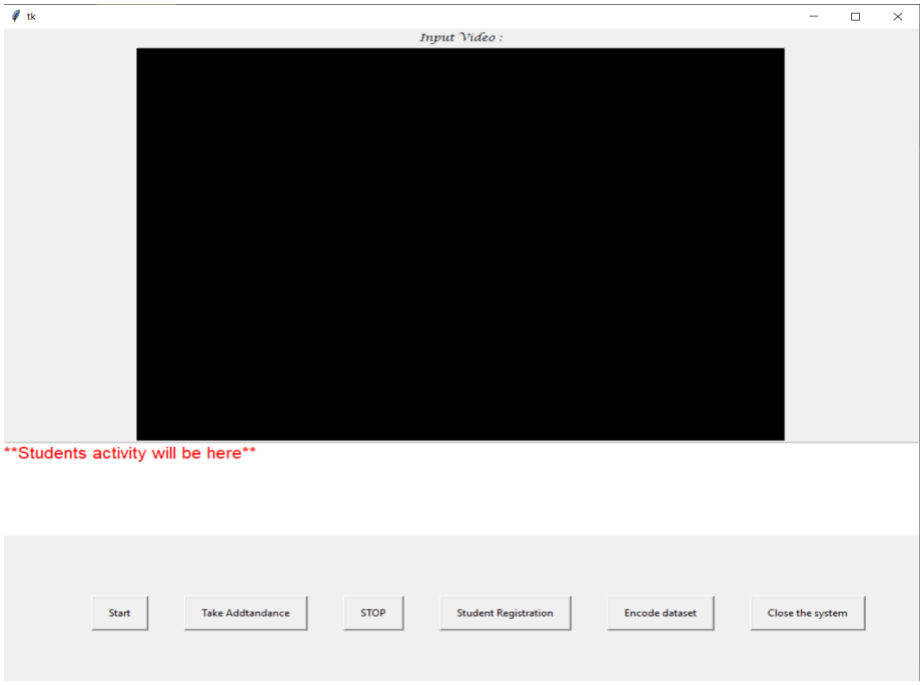
Integration and Testing

System is mainly divided into three different modules:

I. Face detection and recognition module
II. Eye-gaze tracking/ drowsiness detection module
III. Behaviour analysis module

As mentioned in the requirements the system must have login pages for the faculty. Therefore according to the requirement we have performed the login testing.

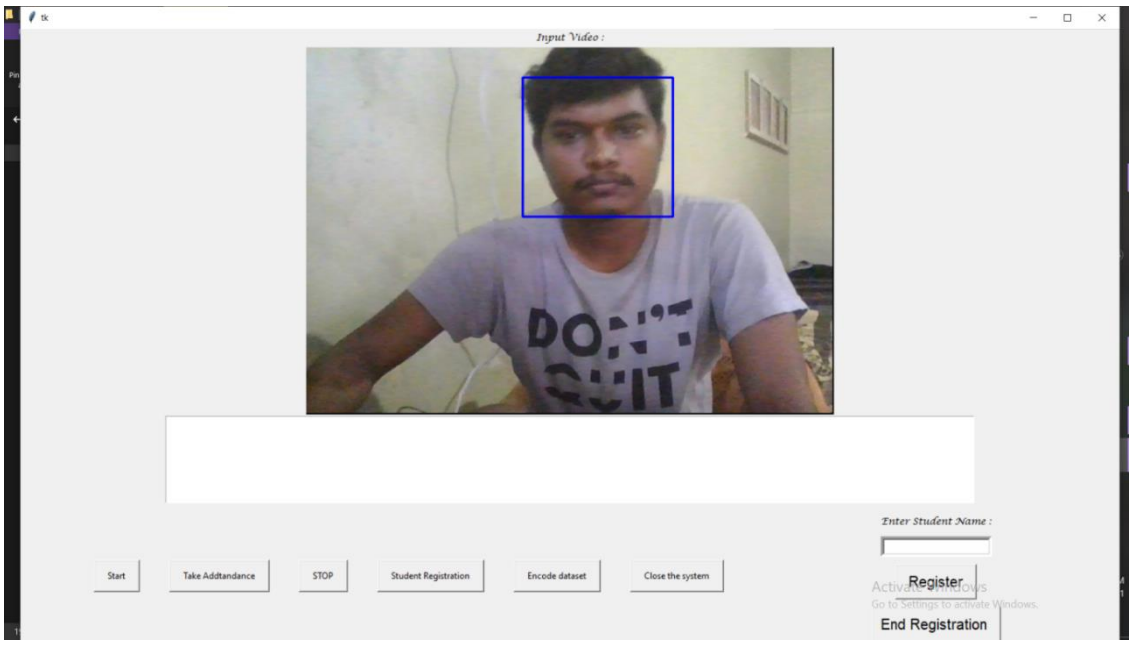
Requirements specified that system must take attendance and generate report therefore we made all the required stuffs.



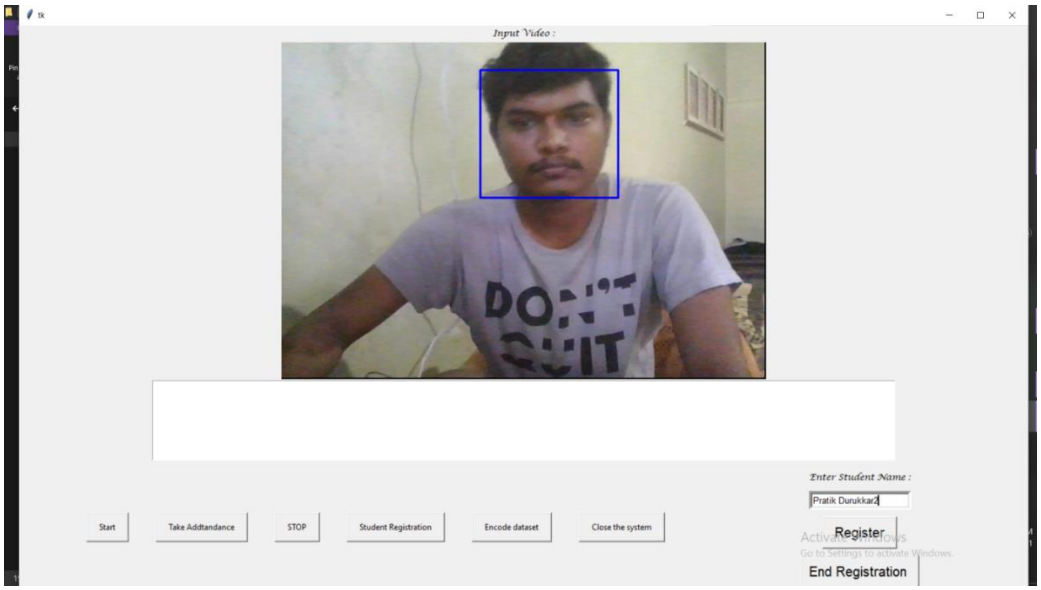
Here different options are available for user through a single click.
Start Button: It will start input video.

Take Attendance: It will take attendance of student by using provided input.
Stop Button: It will stop the video streaming.
Student Registration: Only one time student have to register to this system

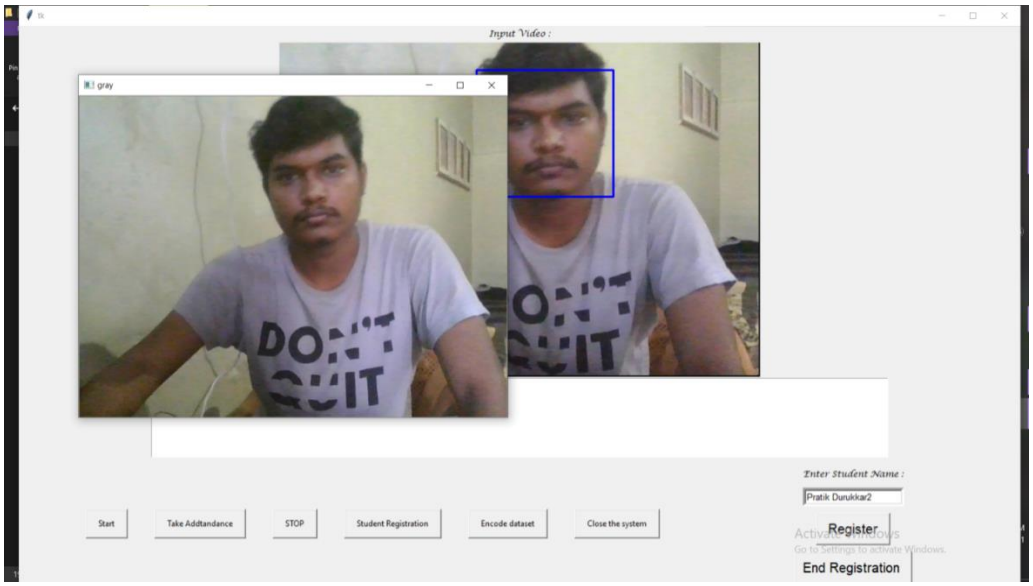
For the face recognition purpose, at the starting student have register to this system, in the registration process system will take photos along with name of student and crop it and after that encoding for each face can be done. It will be like:



At the registration time student need register with their name.

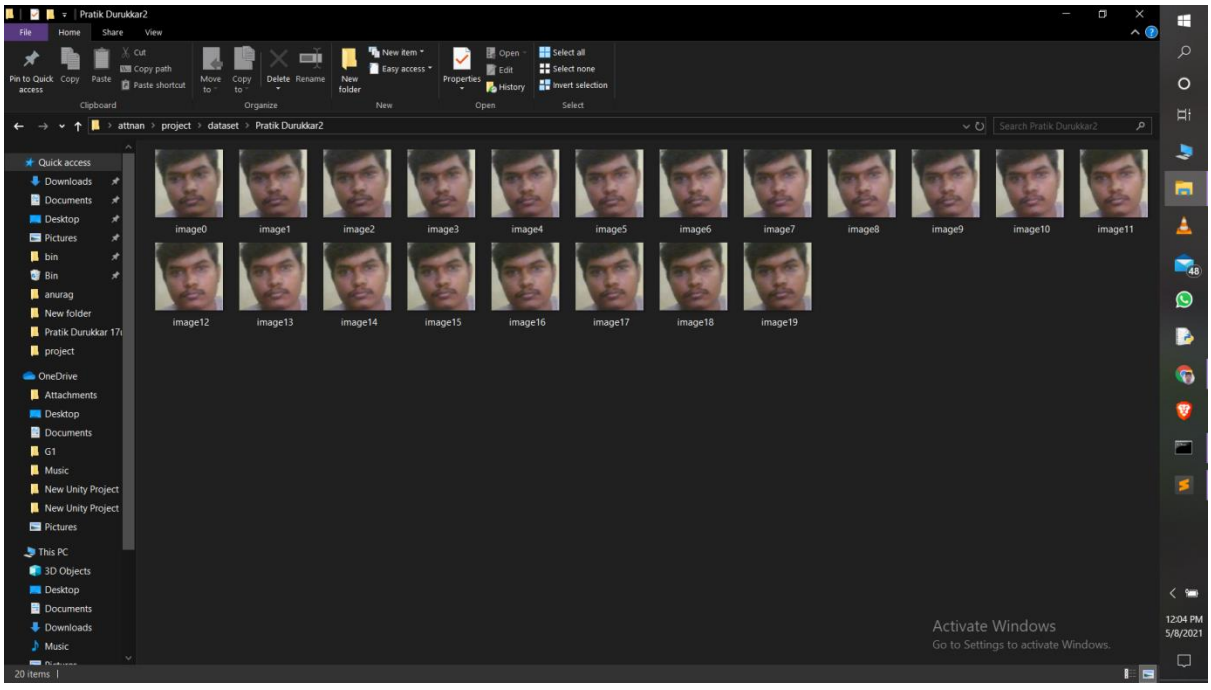


In this above testing image student name is provided as “Pratik Durukkar”



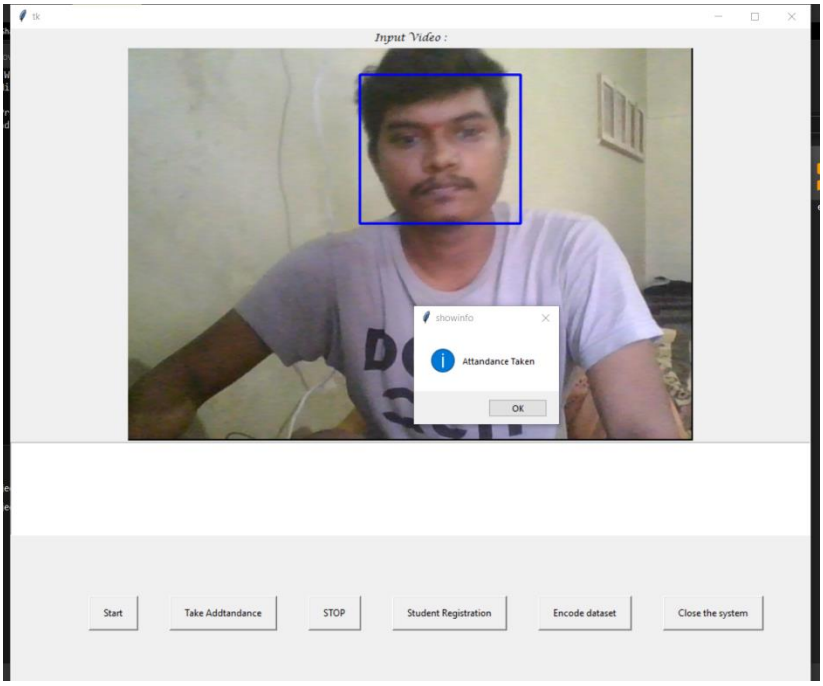
In this above testing image, RGB testing image converted graysacle images.

At the registration time ,images will be taken like this

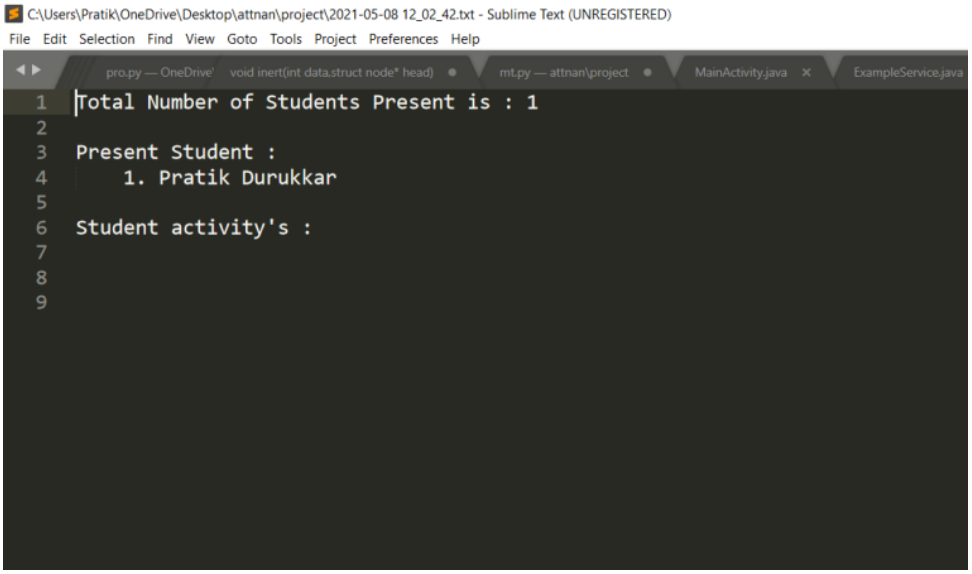


Here registration process ends.

Here we have provided input to System and it will detect faces and draw rectangle for faces, start process work like this and once the face is recognized then attendance of student will be taken:

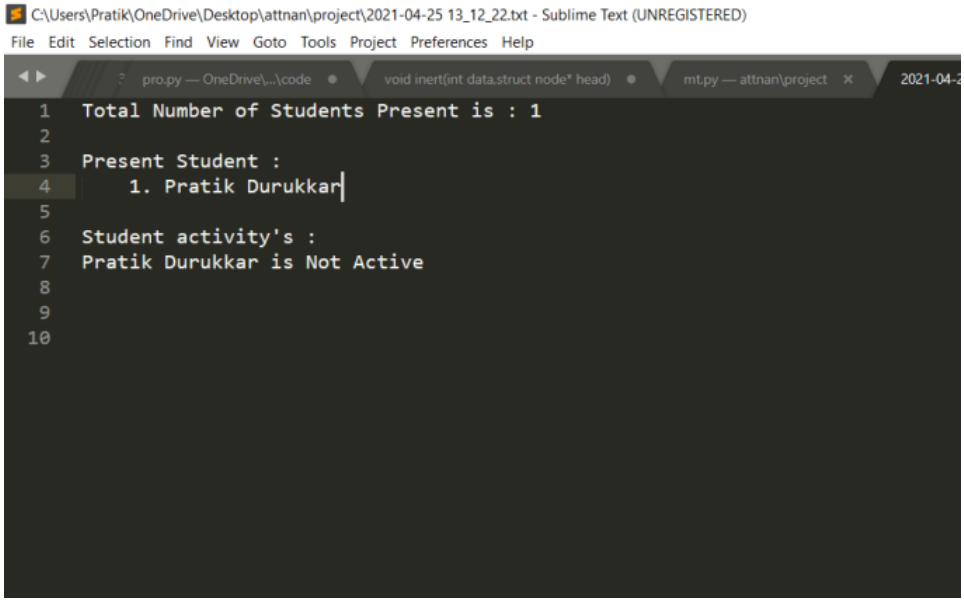


That Attendance will be marked in a file:



As only one student is present in the given frame so there is one name 1. Pratik Durukkar in list of present student.

Then by Eye gaze tracking the activeness of student will be reported as follows:



The activeness will be tracked or marked in student activity as shown in above test image. Here we have achieved our objective. Therefore according the given requirements our system is been tested with all the possible ways and we can say testing is completed.

Performance Analysis:

Performance analysis of the system are as follows:

As per the requirements and the testing we can say that our system works in efficient manner.

The system can successfully register the student and store the images of students with their names.

The system can successfully capture the video and detect the face of the student and recognize the student.

The system can successfully perform the eye gaze tracking and tell the student is active or not.

Finally the system can successfully generate a report of the attendance and the behaviour analysis of the student.

Depending upon the requirements and objectives of the project our system works in efficient manner and performance is up to the mark.

Applications:

Applications of our systems are:

- Smart attendance management system. -

  As manually managing the attendance is time consuming process with the help of this system it can be done automatically in smart way.

- Monitoring system for colleges and private classes.

  This system can be used by any college, school or private classes for better teaching and learning process.

- It will be used for both physical and online lectures.

  Our system now can be used for physical lectures but with few improvements and after connecting it with the online platform it can be used in online lectures.

- Drowsiness detection module helps to increase the accuracy of previous attendance system.

  With the help of this technique faculty can look after each student's attentiveness and thus take proper action for benefit of students.

- Behaviour analysis module generate report that helpful for both teachers and students for future improvement.

  As our system generates the report, with the help of this report faculty can analyze the lecture was interesting for students or not. How many students where active and thus make change in syllabus accordingly so that maximum students are actively involved.

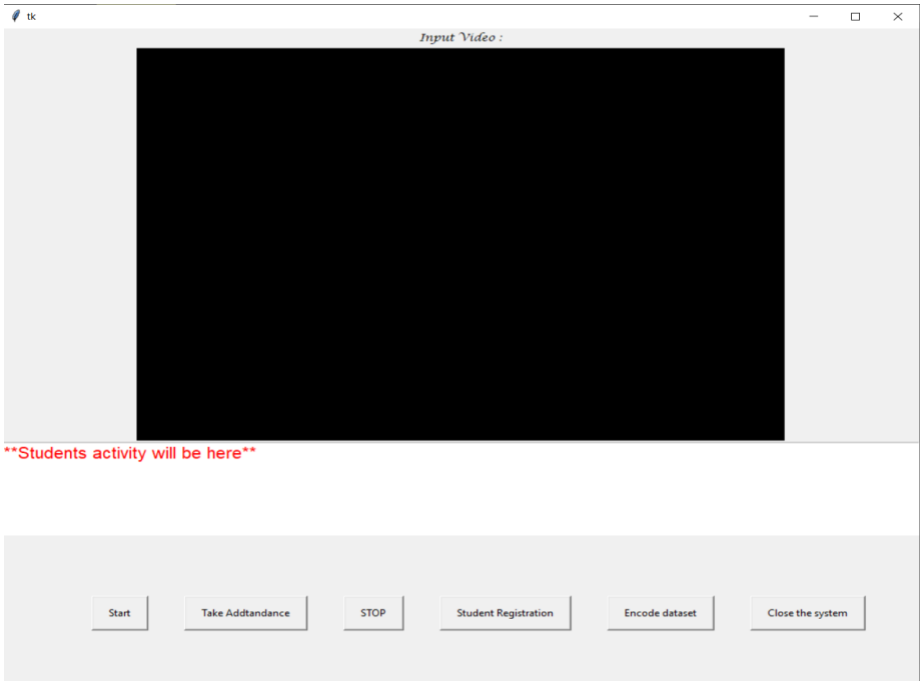
Installation Guide and User Manual:

The steps to install and use the application are:

As mentioned in the software and hardware requirements the user should first install all the software and hardware in order to run the application.

Next step is to install all the required modules which are mentioned in implementation point in very detail method.

Once all the installation of software, hardware and modules we are ready to use the system. When the system is opened we face the login page. Entering the login details the system opens its main page where all the required work can be done. The main page looks as:



Once the **Start** button is clicked the system opens its camera and the camera feed appears on the screen. After the camera is open it will start detecting the faces and recognizing them.

To mark the attendance we need to click on **Take Attendance** button. This will take the attendance and store on the system to generate report later.

The **Stop** button will stop the camera and then no face will be detected.

If the student is new and needs to be registered we need to click on **Student Registration** button. This will store the student's image as well as name in the system so that we can recognize the student and mark the attendance.

Encode data set will start encoding the images and names of the newly registered students.

Finally we can close the system by clicking the last button **Close the System.**

Cost Estimation:

Hardware	**Cost**
Computer System as mentioned in Hardware requirements	Rs.60000/-
Internet	Rs.900/-
Light Source	Rs.300/-
Total	Rs.61200/-

Ethics:

Declaration of Ethics

As A Computer Science & Engineering Student, I believe it is Unethical To,

1. Surf the internet for personal interest and non-class related purposes during classes

2. Act in a manner that is in the not best interests of their client or employer and that is inconsistent with the public interest

3. Make a copy of software for personal or commercial use

4. Make a copy of software for a friend

5. Loan CDs of software to friends

6. Download pirated software from the internet

7. Distribute pirated software from the internet

8. Buy software with a single user license and then install it on multiple Computers

9. Share a pirated copy of software

10. Install a pirated copy of software

11. Be unfair to and not supportive of their colleagues

References:

[1]Visualization Analysis of Learning Attention Based on Single-image PnP Head Pose Estimation

College of Information Science and Technology, Beijing Normal University, 19 Xinjiekouwai Street, Haidian, Beijing, 100875, P. R. China.

[2] Automated Classroom Monitoring With Connected Visioning System

Jian Han Lim, Eng Yeow Teh, Ming Han Geh and Chern Hong Lim Faculty of Computing and Information Technology Tunku Abdul Rahman University College, Setapak, Malaysia.

[3]Classquake: Measuring students' attentiveness in the classroom

Technische Universitat Darmstadt ¨ Dept. of Computer Science Hochschulstr. 10 64289 Darmstadt, Germany.

[4] Sleep Gesture Detection in classroom monitor system

Department of Computer Science and Engineering, Shanghai Jiao Tong University, China

[5] https://www.mdpi.com/2076-3417/9/22/4729

[6] https://ieeexplore.ieee.org/document/8282063

Plagiarism Report:

SmallSEOTools

PLAGIARISM SCAN REPORT

Words	996	Date	May 25,2021
Characters	6452	Excluded URL	

2%	98%	1	44
Plagiarism	Unique	Plagiarized Sentences	Unique Sentences

Content Checked For Plagiarism

Problem definition:
Teaching and learning process are often considered as the most significant activity in an educational institute. During classes, the faculty takes the responsibility of monitoring attendance and the behaviour of the students alongside with the teaching activity. However, manually taking the attendance and monitoring students in a class can be a time consuming job and this directly affects the teaching and learning process.
Furthermore, students' misbehaviour might make the situation worse such as not concentrating, playing mobile phone, moving around, and sneaking out from the class. Teachers can grasp the bad attitudes of students, they will make more reasonable adjustments to vary the educational environment for the students. The teacher can track student behaviour by observing and questioning them in the classroom. This process isn't difficult during a classroom that has few students, but it's an enormous challenge for a classroom with an oversized number of students.
We know that Automated learning analytics is becoming an essential topic in the educational area, which needs effective systems to monitor the learning process and provide feedback to the teacher therefore, to keep the track of students' behaviour within the classroom we thought of developing an automated system that will mark the attendance and monitor the behaviour of students. This will help the teachers to focus on the main syllabus and students to concentrate on studies. With the results that we obtain from the system can be used by the faculty to analyze what number of students are really interested in the subject. Depending upon the analysis the faculty can make changes in the subject syllabus as well as the teaching methods so that a maximum number of students are enthusiastically involved in the learning process. Therefore, our system will overall improve the teaching and learning process.
Aim of the project:
The aim of our project is to develop an Automated System for Student Behaviour Monitoring in Classroom. An automated application for generating detailed reports of students' behavioural and attendance in the classroom from student activities during lectures.
Many factors affect a student's academic performance. Student achievement depends on teachers, education programs, learning environment, study hours, academic infrastructure, institutional climate etc. Another extremely important factor is the learner's behaviour. Major constructs of study behaviour, including study skills, study attitude, and motivation, to have strong interaction with students' learning results. Students' perceptions of the teaching and learning environments influence their study behaviour. This means if teachers can grasp the bad attitudes of students, they will make more reasonable adjustments to vary the educational environment for the students. To conclude whether good or bad behaviour for a particular student is not an easy problem to solve, it must be identified by the teacher who has worked directly in the real environment. To overcome this situation our aim is to develop an automated system.
We know that Automated learning analytics is becoming an essential topic in the educational area, which needs effective systems to monitor the learning process and provide feedback to the teacher to keep the track of students' behaviour in the classroom. Our aim is to develop an automated system that will mark the attendance and monitor the behaviour of students.
Objectives of the project:
The objective is to build an automatic system that allows the faculties to capture and make a summary of student behaviour in the classroom as a part of data acquisition for the decision making process. The system records the whole session and identifies when the students concentrate within the classroom, then reports to the facilities.
There are mainly 2 objectives of our project:

1. To detect faces and recognize them for attendance.
The objective is to detect the faces present in the classroom and recognize them. Also to maintain the attendance of the students. Taking the attendance manually is a time consuming process and sometimes students may involve in making proxy attendance. Therefore this objective will help in taking the attendance in an efficient manner without any misleading.
2. To detect students' attentiveness and behaviour in the classroom during lectures.
The objective is to track the eyes of the students to check if the student is looking at the board or towards the teacher or is busy on the mobile phone or other unnecessary things. Depending upon the time for which the student is looking at the board or other things his/her behaviour is analyzed. If the student is busy on a mobile phone or sleeping for maximum time in the lecture duration his/her behaviour alert will be shown to the faculty. This objective will help the faculty to think on the matter and take necessary actions.
Also the objective is to generate the report. Attendance of each student obtained from the first objective will be used to calculate the overall attendance of the student and accordingly alert the faculty about the attendance of the student.
Also the second second objective output will help in analyzing performance of the student. Together both the objectives will help the teachers to take the necessary actions and also students to concentrate on studies during the lecture.
Scope and limitations of the project
In today's attendance system, faculty goes down the class list and visually verify that all children are accounted for particular lecture and marks the attendance manually. Even though it is the right way, it is not efficient to large classroom and large number of students. Also, for the single professor it is hard to look after each and every student's behaviour during the lectures.
Thus, our idea is to automate this method in which the system will automatically mark the attendance of the students and also monitor the activities of the student during the lectures.
Our System will capture the picture and it will recognise each face and labels it with their name. Then, the system will display the list of present student names with the count of total students. It will also display whether the students are active or inactive during the lectures.

Sources	Similarity
Digitally tracking student behaviour in the classroom ... https://theconversation.com/digitally-tracking-student-behaviour-in-the-classroom-encourages-compliance-not-learning-110181	5%

SmallSEOTools

PLAGIARISM SCAN REPORT

Words	998	Date	May 25,2021
Characters	6347	Excluded URL	

9%	91%	4	42
Plagiarism	Unique	Plagiarized Sentences	Unique Sentences

Content Checked For Plagiarism

We started the project by gathering the related documents to the project at the end of July 2020. Gathering the requirements and all the analysis tasks was done by mid of August 2020. After that System design was started in the month of September 2020 and completed by the start of November along with the UML diagrams and Synopsis with rough idea of the project. In November 2020 we started making the detailed SRS documents along with deciding the methodology for the project which was completed by mid-December 2020. By the start of January 2021 we started coding by dividing it into 3 modules and completed the 1st module by mid-January 2021. Other two modules were completed by the end of February 2021. By the end of March 2021 we started testing the project alongside designing the GUI which was completed in the first week of April 2021.
Literature overview:
In an article published online in The Guardian, one of the authors asked the question: "Are lectures the best way to teach students?" In the beginning of the article, they start with lecture halls and lectures, describing their darkness, endless PowerPoint slides, and the distraction of students themselves and others when browsing the web and social networks. In such a scenario, it is crucial for lecturers to recognize indications of students' loss of attention to respond with appropriate methods. Traditional lectures conducted in classrooms are the predominant teaching paradigm since medieval universities. Critics point out the one-to-many method of communication of lectures assigning students a passive role.
In a study it was found that attention breaks do appear to exist and occur generally throughout lectures. It was also observed that after about 15 minutes a lecture started, 10 percent of the audience showed signs of inattention. It was reported that the number of students paying attention begins to drop dramatically with a resulting loss in retention of lecture material, which is noticeable that immediately after the lecture students remembered 70 percent of information presented in the first ten minutes of the lecture and 20 percent of information presented in the last ten minutes. Another survey written in the study showed that 71% of teachers thought technology damaged students' attention. And 64% people who took another survey said that technology did more to distract students than to help them academically
To overcome this problem in the universities many came forward to provide a solution. Most of them could not find the proper solution and solutions could not work as students found out another alternative to escape from the built solutions.
Investigation of current project and related work
Lot of people are working in this field to find the solution for teaching and learning problems. Many of them came up with good paper work for the problem but few were not that practical to implement into a classroom and real environment. Some of them came with really heavy and costly solutions which required technical skill and also extra human power to implement in a university or school. Here are some examples of the papers that proposed the solution.
Visualization Analysis of Learning Attention Based on Single-image.
College of Information Science and Technology, Beijing Normal University, 19 Xinjiekouwai Street, Haidian, Beijing, 100875, P. R. China
This paper proposed the technique of real time capturing the image of the classroom and checking whether the students are paying attention in the lecture by estimating the head pose of each student. This was done using Machine learning algorithms. Initially this solution seemed to be working, but later they came to know that only head pose estimation will not work as students may just keep their head up towards the camera while taking the image and later do anything they want. Deciding the attentiveness using a single image was not the proper solution. This technique

could only estimate the head pose of the student and could not determine which student is attentive and which is not. Due to it's this limitation this could not work.
Automated Classroom Monitoring With Connected Visioning System.
Faculty of Computing and Information Technology Tunku Abdul Rahman University College, Setapak, Malaysia.
This paper proposed the technique of using IoT technology. They used the items embedded with electronics, software, sensors, to the network which enable these objects to collect, exchange, and analyze the data. This technique of using the IoT framework helped to find the solution for the problem. It involved recognizing the faces of students and then estimating the motions like determining if one is entering or leaving the classroom. This consists of three main functions, which are body detection, motion tracking and motion recognition. However this module worked very efficiently but the amount of resource and human power required was more.
Classquake: Measuring students' attentiveness in the classroom
Technische Universitat Darmstadt ˜ Dept. of Computer Science Hochschulstr. 10 64289 Darmstadt, Germany.
This paper proposes the app named Classquake which should be installed on the mobile phone of the students. This app uses students' smartphones as decentralized sensors to measure their activity and attentiveness during lectures. As the students use their mobile phones most of the time during the lecture this app will help to know the time for which the students are busy on the mobile phone. However this could only determine the use of mobile phones in the classroom and is not the proper solution for the problem. We will not be able to find the student who is using the mobile phone.
Sleep Gesture Detection in classroom monitor system
Department of Computer Science and Engineering, Shanghai Jiao Tong University, China
This paper proposes the technique of using the images of students sleeping in a classroom as a dataset and then training the model for detecting the sleeping students in a real classroom. They will make use of cameras in the classroom and capture the images of the students sleeping and later inform the faculty about it so that the faculty can later take proper action on the student.

Sources	Similarity
Classquake: Measuring Students' Attentiveness in the Classroom ... In such a scenario, it is crucial for lecturers to recognize indications of students' loss of attention to respond with appropriate methods. Sign in to Continue ... http://ieeexplore.ieee.org/document/7442399/definitions	9%
Applied Sciences | Free Full-Text | A Computer-Vision Based ... by B Ngoc Anh · 2019 · Cited by 10 — Additionally, a survey written in the study showed that 71% of teachers thought technology damaged students' attention. And 64% people who took another ... https://www.mdpi.com/2076-3417/9/22/4729/htm	5%
Proceedings of APSIPA Annual Summit and Conference 2017 12 ... Faculty of Computing and Information Technology Tunku Abdul Rahman University College, Setapak, Malaysia Email: chilm@acd.tarc.edu.my Abstract—Internet of Things (IoT) with the concept of integrat-ing connectivity, sensors, data analysis and decision making in an underlying framework has ease many real world problems. In this work, we study the application of IoT for education purpose. Stu ... http://www.apsipa.org/proceedings/2017/CONTENTS/papers2017/13DecWednesday/WP-02/WP-02.4.pdf	4%
Welcome to NSEC lab https://nsec.sjtu.edu.cn/people/	3%

SmallSEOTools

PLAGIARISM SCAN REPORT

Words	745	Date	May 25,2021
Characters	4767	Excluded URL	

7% Plagiarism	93% Unique	3 Plagiarized Sentences	38 Unique Sentences

Content Checked For Plagiarism

Software requirements:
• Windows 7 or later with MS office.
• SQL Server.
• Python programing language.
Hardware requirements:
• Processor - Intel core i5 or later
• 64 bit OS
• RAM - Minimum 4GB
• Secondary storage - Minimum 8GB
• Camera - Minimum 2MP
Functional Requirements:
RS1: The system should provide database to store login credentials. This will store the registration data entered by faculty.
RS2: The system should have a login. A login box should appear when the system is invoked
RS3: The system should crosscheck entered details. To crosscheck the entered details with the details present in the database.
RS4: System should inform about wrong login. System should be able to inform the user when wrong login id or password is entered.
RS5: The system should provide a database to store the images of student's face. This will help in identifying the student's face.
RS6: The system should detect and recognize the face of the students. When the student's image /video is seen by the system it will mark the attendance.
RS7: System must perform eye gaze tracking. This will check if the student is not sleeping.
RS8: System should recognize the student who was sleeping. Helpful to mark the behavior.
RS9: System should calculate the attendance and make behavioral analysis of student. This will give the behavioral analysis of all the students.
RS10: System should provide database to store the attendance and behavioral analysis. Helpful in keeping the record of the students.
RS11: System should generate report. To make the proper decisions on students as well as teaching techniques.
Nonfunctional requirements:
RS1: System should store sufficient images of students to recognize their faces.
RS2: System should identify right student with right name. (Labeling of image with name must be done correctly)
RS3: Attentiveness must be displayed in proper time and if inactive for particular time period then system must mark inactive to that student.
RS4: Report must be generated with proper date and time.
Face detection and recognition module:
This module will capture the images/video of the students with the help of camera. These images/video will be used to detect the faces and recognize them with the help of Dataset labeling of image and name of the student can be done.
Eye-gaze tracking/ drowsiness detection module

This module will use the images/video captured form above module and then perform eye gaze tracking along with drowsiness detection. There is a dataset provided because this will again help in mapping or labeling the image and name of the student from above module.
Behaviour analysis module:
This is the last module where the output from 1st two modules will be used to mark the attendance and calculate the behaviroul analysis.
We have performed Object Detection using Haar feature-based cascade classifiers. Basically it works in flow of:
• Calculating Haar Features
• Creating Integral Images
• Implementing Cascading Classifier
Initially, the algorithm needs tons 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 within the below image are used. Each feature is a single value obtained by subtracting the sum of pixels under white rectangle from the sum of pixels under black rectangle.
This step involves large calculations to find out features from an image. To solve this computational problem integral image concepts are introduced. Integral images speed up the calculation of those Haar features. Instead of computing at every pixel it creates sub rectangles in a given window, for each feature will find the best threshold which classifies the faces to positive and negative.
In a picture , most of the region is a non -face region. So it is better to have a simple method to check if the window is not a face region. If it is not a face region, discard it in a single shot. Don't process it again. Instead target the region where there can be a face. This way, we will find more time to see a possible face region.
In a cascade classifier rather than applying all the features together on a window, group the features into different stages of classifiers and apply one-by-one. If window fails in first stage discard it. Then no need to consider remaining features on it. If it passes, apply the next stage features and continue the process. Finally the window which passes all the stages is a face region.

Sources	Similarity
Project report on ONLINE REAL ESTATE BUSINESS · A login box should appear when the system is invoked. The Admin should have all the type of authority. The Admin should maintain property .Admin identify property type as it is residential or commercial property. The Admin user can inform their agents for regarduing to property and update the information regarding property and cancellation of property or changing buyer choice. The user should book the property for sell or rent with detail of property… https://www.slideshare.net/divyeshsarkar/se-final-report	25%
Face Detection using OpenCV and Python. · Each feature is a single value obtained by subtracting the sum of pixels under white rectangle from the sum of pixels under black rectangle. These features are calculated for all possible location and scale.But among all feature we calculate most of them are irrelevant. https://pytech-solution.blogspot.com/2017/09/face-detection-using-opencv-and-python.html	4%
OpenCV: Face Detection using Haar Cascades 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 … http://www.bim-times.com/opencv/3.3.0/d7/d8b/tutorial_py_face_detection.html	4%

SmallSEOTools

PLAGIARISM SCAN REPORT

Words	994	Date	May 25,2021
Characters	5932	Excluded URL	

7% Plagiarism	93% Unique	4 Plagiarized Sentences	53 Unique Sentences

Content Checked For Plagiarism

Implementation details for Registration of student:
First of all we need to register a student so that we can detect and recognize the student for the attendance and monitoring the behaviour in class. Registration is the process of taking the image along with the name of the student and store it into the database. This will help the system to detect and recognize the students in the class that is labelling the output image or video with the input name and image as we used while registration. Registration will help in improving the efficiency of the system and will be user friendly to generate the report of attendance and monitoring the behaviour. Also registration is done to make a list of the known students in the classroom.
In this system for registration of the student we take the name of student and then the image of the student. For this purpose we used modules such as OS module and CV2 module.
The OS module provides functions for interacting with the OS . The os.path module include many functions to interact with the file system.
OpenCV is a cross-platform library using which we will develop real-time computer vision applications. It mainly focuses on image processing, video capture and analysis including features like face detection and object detection.
At first we need to define the path where we want to store the images and names of the registered students. Then we need to add another directory for the new registration. With the help of os.path.join () method we merged the main directory where all the registered students are present with the new registration. Here we can check if the student is already registered or not. For this we use os.path.isdir () method which is employed to examine whether the new registration is an existing directory or not. If the student is not already registered then we create the new directory with the name of the student. os.mkdir () method is used to create new directory.
Next step is to store the images of the student in that directory. With the help of OpenCV we can capture the image/video from the camera. VideoCapture () method is used to get a video capture object form the camera. Now we use read () method to read the frames using the above created object and imwrite () method is used to save an image in the directory. Further imread () and imshow () methods are used to load the image and show the image respectively. Thus we can say now the registration of the student is completed and with the help of face detection and recognition technique we can mark attendance.
Implementation details for Face detection and recognition:
Here we are giving this solution to achieve our first objective that is to mark attendance automatically by using image processing technique. For this first system should recognize the faces from input. Face recognition module consists of three main steps which are image pre-processing, then face detection can be done by using suitable algorithms and last one face recognition.
For face detection purposes we need to take input as an image or video. By using the method VideoCapture.read () input can be taken. For face detection we need to import cv2 and numPy. After importing and taking input, the next step is to convert that RGB image into gray scale and for this purpose we have used the cv2.cvtColor () method .Generally the images are in the form of RGB format (Red, Green, Blue). So, when OpenCV reads the RGB image, it usually stores the image in BGR (Blue, Green, Red) Format. RGB to grayscale conversion is done because it is easy to process and is computationally less intensive as it is converted from 3d matrix to 2d matrix.
Gray = cv2.cvtColor (frame, cv2.COLOR_BGR2GRAY)
In this method we have to pass two arguments first one is the input object and second one is COLOR_BGR2GRAY. Now after converting the image from RGB to Gray, we'll now attempt to locate the exact features in our face. Here is the

code:
Faces = face_classifier.detectMultiScale (gray, 1.5, 5)
In this piece of code what we are trying to do is, using the face_classifier which is an open framework application. Which rapidly trains a classifier to recognize facial expressions. We are using an inbuilt function with it called the detectMultiScale. This function will help us to seek out the features/locations of the new image. The way it does is, it'll use all the features from the face_classifier object to detect the features of the new image. The parameters that we'll pass to the present function are:
1. The gray scale variable — gray in in this case
2. scaleFactor — Parameter specifying what proportion the image size is reduced at each image scale. Basically, the scale factor is used to make your scale pyramid. More explanation, model features a fixed size defined during training, which is visible within the XML. This means that this size of the face is detected within the image if present. However, by rescaling the input image, you'll resize a bigger face to a smaller one, making it detectable by the algorithm. 1.05 is a good possible value for this, which implies you use alittle step for resizing, i.e. reduce the dimensions by 5%, you increase the possibility of an identical size with the model for detection is found. This also means the algorithm works slower since it's more thorough. You may increase it to as much as 1.5 for faster detection. In our case, I have used 1.5 as the scaleFactor.
3. minNeighbors — Parameter specifying what percentage neighbors each candidate rectangle should need to retain it. In this case, we have taken 6 as the minNeighbors.
From the above step, the function detectMultiScale returns 4 values — x-coordinate, y-coordinate, width(w) and height(h) of the detected feature of the face. Based on these 4 values we'll draw a rectangle round the face.

Sources	Similarity
towardsdatascience.com So, when OpenCV reads the RGB image, it usually stores the image in BGR (Blue, Green, Red) Format. https://towardsdatascience.com/computer-vision-detecting-objects-using-haar-cascade-classifier-4585472829a9	6%
Facial Recognition in Web Camera using Deep Learning under ... using the face_classifier which is an object loaded with haarcascade_frontalface_default.xml, we are using an inbuilt function with it called the detectMultiScale. This function will help us to find the features/locations of the new image. The way it does is, it will use all the features https://grdjournals.com/uploads/article/GRDJE/V05/I07/0029/GRDJEV05I070029.pdf	3%

SmallSEOTools

PLAGIARISM SCAN REPORT

Words	937	Date	May 25,2021
Characters	6271	Excluded URL	

5%	95%	2	38
Plagiarism	Unique	Plagiarized Sentences	Unique Sentences

Content Checked For Plagiarism

After detection of face from input (which is either image or video), Next task is to recognize the faces from input which important step to achieve both of objectives of our project.
A lot of face recognition models are available in open source as well. In this particular task one such python library named face_recognition is used to recognize faces from input.
This library works in few steps:
● Identify a face in given image
● Identify specific features in the face
Based on this encoding, one can measure similarity between two face images that can determine if they belong to the same person or not.
Here are the steps to achieve face recognition:
First thing is to install face recognition module by using following command:
Pip install face_recognition
Import face_recognition
The output of face detection is nothing but input in face recognition if face is detected. After cropping the image have convert in an array of size 128:
Lastimg = cv2.resize(faceimg, (128, 128))
Face_loaction method returns four points which are measurements of image top, right, left, bottom used following line of code:
Boxes= face_recognition.face_locations (lastimg.model = args ["detection_method"])
For face recognition, the algorithm notes certain important measurements on the face just like the color and size and slant of eyes, the gap between eyebrows, etc. All these put together define the face encoding — the knowledge obtained out of the image — that's used to identify the actual face. To create encoding we used:
encodings = face_recognition.face_encodings(lastimg, boxes)
After that need to compare the current encoding with the encoding which created at the registration time. It can be done by using following:
matches = face_recognition.compare_faces(data["encodings"], encoding)
If matches are found then just append that matched name into the list.
Implementation for Eye gaze tracking:
Here we are giving this solution to achieve our second objective that is to check what amount of period student attend the lecture with full attention or without any misbehaviour by using eye aspect ratio (EAR). This system should recognize the faces from input.
Eye gaze tracking module consists of three main steps which Eye localization, Thresholding to find the white spaces of the eyes, determining if the "white" region of the eyes disappears for a period of time and can be done by using eye aspect ratio.
Understanding of Eye aspect Ratio (EAR):
The eye ratio is instead how more elegant solution that involves a really simple calculation supported the ratio of distances between facial landmarks of the eyes.
This method for blink detection is fast, efficient, and straightforward to implement. This also implies that we can extract specific facial structure by knowing the indexes of the actual face parts:

In terms of blink detection, we are only curious about two sets of facial structures — the eyes.
Each eye is represented by 6 (x, y)-coordinates, starting at the left-corner of the attention (as if you were watching the person), then working clockwise round the remainder of the region:
To localize of facial landmark from the video input face_utils. FACIAL_LANDMARKS_68_IDXS used
(lStart, lEnd) = face_utils.FACIAL_LANDMARKS_68_IDXS["left_eye"]
(rStart, rEnd) = face_utils.FACIAL_LANDMARKS_68_IDXS["right_eye"]
For calculating eye aspect ratio here we create the method that takes the input as the shape of above facial landmark of eye. For both left and right eye landmark EAR is calculated separately.
def eye_aspect_ratio(eye):
leftEye = shape[lStart:lEnd]
rightEye = shape[rStart:rEnd]
leftEAR = eye_aspect_ratio(leftEye)
rightEAR = eye_aspect_ratio(rightEye)
In this above EAR method we actually calculate the eye aspect ratio by using equation of EAR.
Based on the work by Soukupova and cech in their 2016 paper, Real-Time blink Detection using Facial Landmarks, we will then derive an equation that reflects this relation called the eye aspect ratio (EAR):
The numerator of this equation computes the space between the vertical eye landmarks while the denominator computes the space between horizontal eye landmarks, weighting the denominator appropriately since there's only one set of horizontal points but two sets of vertical point. Above equation is used as follows for the both eye that are the input for the EAR method
A = distance.euclidean(eye[1], eye[5])
B = distance.euclidean(eye[2], eye[4])
C = distance.euclidean(eye[0], eye[3])
return ear
Above return output as EAR for left or right eye. Then for both eyes new EAR is calculated as
ear = (leftEAR + rightEAR) / 2.0
If calculated EAR for both eyes is less than the threshold value (i.e. 0.25) then function return that the student is not active or active if EAR is greater than the threshold value. Well, as we'll determine , the attention ratio is approximately constant while the attention is open, but will rapidly fall to zero when a student closes eyes.
Using this easy equation, we will avoid image processing techniques and easily believe the ratio of eye landmark distances to determine if an individual is blinking.
Fig. Top-left: A visualization of eye landmarks when then the attention is open. Top-right: Eye landmarks when the eye is closed. Bottom: Plotting the eye aspect ratio over time. The dip within the eye ratio indicates eyes closed
On the top-left we've an eye fixed that's fully open — the attention ratio here would be large(r) and comparatively constant over time. However, once the person blinks (top-right) the attention ratio decreases dramatically, approaching zero. The bottom figure plots a graph of the attention ratio over time for a video clip. As we will see, the attention ratio is constant, then rapidly drops close to zero, then increases again, indicating one blink has taken place.
Student is "active or not active" is the final output of the eye gaze tracking module is provided as input to behavioural analysis module.

Sources	Similarity
Next Article: Eye blink detection with OpenCV, Python, and dlib Apr 24, 2017 — Based on the work by Soukupová and Čech in their 2016 paper, Real-Time Eye Blink Detection using Facial Landmarks, we can then derive an equation that reflects this relation called the eye aspect ratio (EAR):.. Figure 4: ... https://www.pyimagesearch.com/2017/04/24/eye-blink-detection-opencv-python-dlib/	4%
hackabit18/c0de_BrEaKeRs - GitHub Using this simple equation, we can avoid image processing techniques and simply rely on the ratio of eye landmark distances to determine if a person is blinking ... https://github.com/hackabit18/c0de_BrEaKeRs	3%

SmallSEOTools

PLAGIARISM SCAN REPORT

Words	950	Date	May 25,2021
Characters	6204	Excluded URL	

4%	96%	2	46
Plagiarism	Unique	Plagiarized Sentences	Unique Sentences

Content Checked For Plagiarism

Implementation for Report generation:
As we have to show the final output of the Attendance and Behaviour as the Report of Students it contains the following points: date.today ()
Then we used the date.today () method to get the current local date. It returns a date object, which is assigned to the "now" variable.
txt.get('1.0',END)
This method reads the data that is stored in act variable, from the first char till end as "1.0" mean Line 1, first char.
To get the length of string len() is used which will return the length of names stored in array, whose result will be stored in "count" variable.
Attendance=open (str(now)+" "+ str (Ctime)+".txt",'a')
The new file is opened with the current local time as Attendance and it contains the count of total number of students present in the classroom. It also contains the names of present student in the file. Each name is given a unique number to identify them separately. Then the names are labelled for each student face recognition. This all process of Attendance is done using Attendance.write () method which writes the specified text to the file
Next, the Messagebox.showinfo () is used to show some relevant information to the user. It basically displays the message that Attendance is taken successfully. The file also states the student activities during the lectures. First, it shows the text as "Student activity:" and the activity is shown as either active or inactive.
Example :(Only for 1 student)
Total Number of Students Present is: 1
Present Student:
1. Pratik Durukkar
Student activities:
Pratik Durukkar is Not Active
Here, the count is shown and attendance is marked also the eye gazing method records the behaviour of the student and accordingly the activity of the student is stated in the report of Students Also the message box occurs if something wrong happens in the system.
System is mainly divided into three different modules:
I. Face detection and recognition module
II. Eye-gaze tracking/ drowsiness detection module
III. Behaviour analysis module
As mentioned in the requirements the system must have login pages for the faculty. Therefore according to the requirement we have performed the login testing.

Requirements specified that system must take attendance and generate report therefore we made all the required stuffs.

Here different options are available for user through a single click.
Start Button: It will start input video.
Take Attendance: It will take attendance of student by using provided input.

Stop Button: It will stop the video streaming.
Student Registration: Only one time student have to register to this system
For the face recognition purpose, at the starting student have register to this system, in the registration process system will take photos along with name of student and crop it and after that encoding for each face can be done. It will be like:

At the registration time student need register with their name.

In this above testing image student name is provided as "Pratik Durukkar"

In this above testing image, RGB testing image converted graysacle images.
At the registration time ,images will be taken like this

Here registration process ends.
Here we have provided input to System and it will detect faces and draw rectangle for faces, start process work like this and once the face is recognized then attendance of student will be taken:

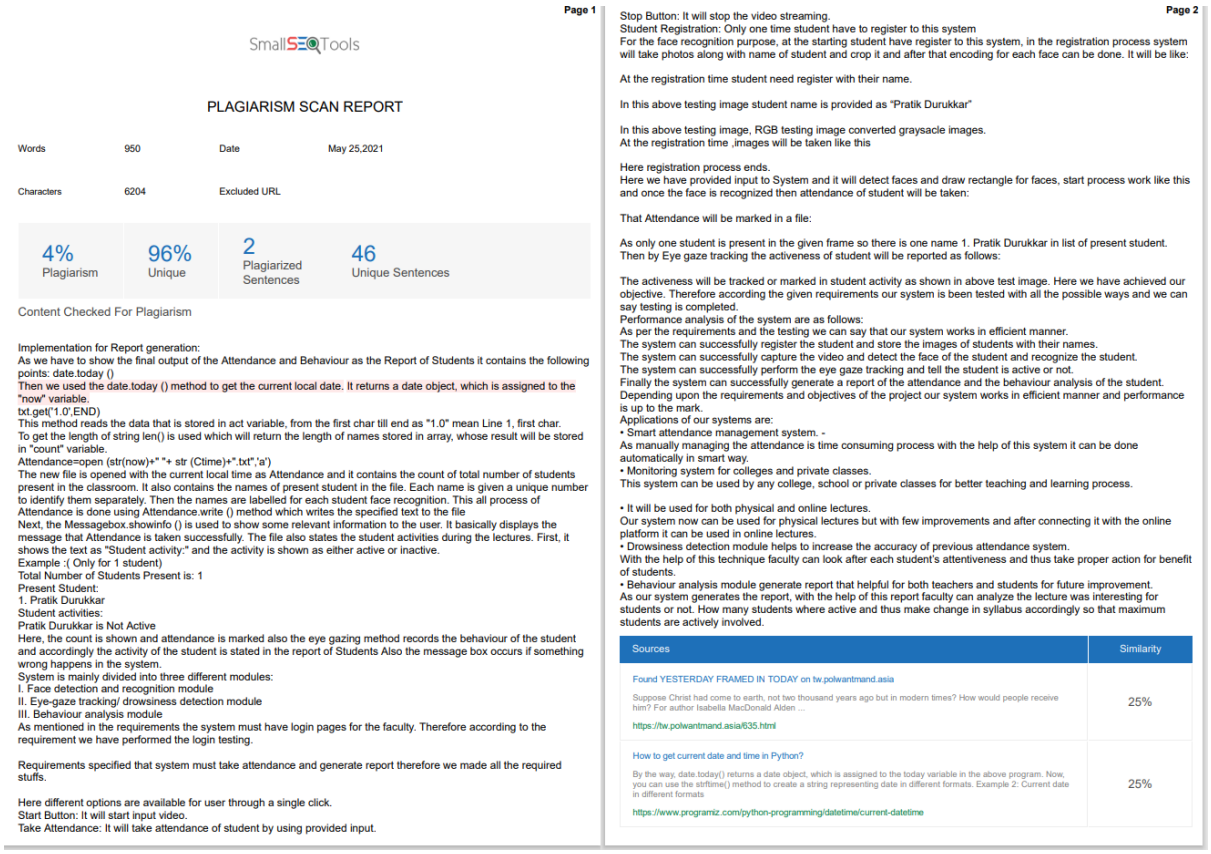
That Attendance will be marked in a file:

As only one student is present in the given frame so there is one name 1. Pratik Durukkar in list of present student.
Then by Eye gaze tracking the activeness of student will be reported as follows:

The activeness will be tracked or marked in student activity as shown in above test image. Here we have achieved our objective. Therefore according the given requirements our system is been tested with all the possible ways and we can say testing is completed.
Performance analysis of the system are as follows:
As per the requirements and the testing we can say that our system works in efficient manner.
The system can successfully register the student and store the images of students with their names.
The system can successfully capture the video and detect the face of the student and recognize the student.
The system can successfully perform the eye gaze tracking and tell the student is active or not.
Finally the system can successfully generate a report of the attendance and the behaviour analysis of the student.
Depending upon the requirements and objectives of the project our system works in efficient manner and performance is up to the mark.
Applications of our systems are:
• Smart attendance management system. -
As manually managing the attendance is time consuming process with the help of this system it can be done automatically in smart way.
• Monitoring system for colleges and private classes.
This system can be used by any college, school or private classes for better teaching and learning process.

• It will be used for both physical and online lectures.
Our system now can be used for physical lectures but with few improvements and after connecting it with the online platform it can be used in online lectures.
• Drowsiness detection module helps to increase the accuracy of previous attendance system.
With the help of this technique faculty can look after each student's attentiveness and thus take proper action for benefit of students.
• Behaviour analysis module generate report that helpful for both teachers and students for future improvement.
As our system generates the report, with the help of this report faculty can analyze the lecture was interesting for students or not. How many students where active and thus make change in syllabus accordingly so that maximum students are actively involved.

Sources	Similarity
Found YESTERDAY FRAMED IN TODAY on tw.polwantmand.asia Suppose Christ had come to earth, not two thousand years ago but in modern times? How would people receive him? For author Isabella MacDonald Alden ... https://tw.polwantmand.asia/635.html	25%
How to get current date and time in Python? By the way, date.today() returns a date object, which is assigned to the today variable in the above program. Now, you can use the strftime() method to create a string representing date in different formats. Example 2: Current date in different formats https://www.programiz.com/python-programming/datetime/current-datetime	25%



Page 1

SmallSEOTools

PLAGIARISM SCAN REPORT

Words	950	Date	May 25,2021
Characters	6204	Excluded URL	

4% Plagiarism	96% Unique	2 Plagiarized Sentences	46 Unique Sentences

Content Checked For Plagiarism

Implementation for Report generation:
As we have to show the final output of the Attendance and Behaviour as the Report of Students it contains the following points: date.today ()
Then we used the date.today () method to get the current local date. It returns a date object, which is assigned to the "now" variable.
txt.get("1.0',END)
This method reads the data that is stored in act variable, from the first char till end as "1.0" mean Line 1, first char.
To get the length of string len() is used which will return the length of names stored in array, whose result will be stored in "count" variable.
Attendance=open (str(now)+" "+ str (Ctime)+".txt",'a')
The new file is opened with the current local time as Attendance and it contains the count of total number of students present in the classroom. It also contains the names of present student in the file. Each name is given a unique number to identify them separately. Then the names are labelled for each student face recognition. This all process of Attendance is done using Attendance write () method which writes the specified text to the file
Next, the Messagebox.showinfo () is used to show some relevant information to the user. It basically displays the message that Attendance is taken successfully. The file also states the student activities during the lectures. First, it shows the text as "Student activity:" and the activity is shown as either active or inactive.
Example :(Only for 1 student)
Total Number of Students Present is: 1
Present Student:
1. Pratik Durukkar
Student activities:
Pratik Durukkar is Not Active
Here, the count is shown and attendance is marked also the eye gazing method records the behaviour of the student and accordingly the activity of the student is stated in the report of Students Also the message box occurs if something wrong happens in the system.
System is mainly divided into three different modules:
I. Face detection and recognition module
II. Eye-gaze tracking/ drowsiness detection module
III. Behaviour analysis module
As mentioned in the requirements the system must have login pages for the faculty. Therefore according to the requirement we have performed the login testing.

Requirements specified that system must take attendance and generate report therefore we made all the required stuffs.

Here different options are available for user through a single click.
Start Button: It will start input video.
Take Attendance: It will take attendance of student by using provided input.

Page 2

Stop Button: It will stop the video streaming.
Student Registration: Only one time student have to register to this system
For the face recognition purpose, at the starting student have register to this system, in the registration process system will take photos along with name of student and crop it and after that encoding for each face can be done. It will be like:

At the registration time student need register with their name.

In this above testing image student name is provided as "Pratik Durukkar"

In this above testing image, RGB testing image converted graysacle images.
At the registration time ,images will be taken like this

Here registration process ends.
Here we have provided input to System and it will detect faces and draw rectangle for faces, start process work like this and once the face is recognized then attendance of student will be taken:

That Attendance will be marked in a file:

As only one student is present in the given frame so there is one name 1. Pratik Durukkar in list of present student.
Then by Eye gaze tracking the activeness of student will be reported as follows:

The activeness will be tracked or marked in student activity as shown in above test image. Here we have achieved our objective. Therefore according the given requirements our system is been tested with all the possible ways and we can say testing is completed.
Performance analysis of the system are as follows:
As per the requirements and the testing we can say that our system works in efficient manner.
The system can successfully register the student and store the images of students with their names.
The system can successfully capture the video and detect the face of the student and recognize the student.
The system can successfully perform the eye gaze tracking and tell the student is active or not.
Finally the system can successfully generate a report of the attendance and the behaviour analysis of the student.
Depending upon the requirements and objectives of the project our system works in efficient manner and performance is up to the mark.
Applications of our systems are:
• Smart attendance management system. -
As manually managing the attendance is time consuming process with the help of this system it can be done automatically in smart way.
• Monitoring system for colleges and private classes.
This system can be used by any college, school or private classes for better teaching and learning process.

• It will be used for both physical and online lectures.
Our system now can be used for physical lectures but with few improvements and after connecting it with the online platform it can be used in online lectures.
• Drowsiness detection module helps to increase the accuracy of previous attendance system.
With the help of this technique faculty can look after each student's attentiveness and thus take proper action for benefit of students.
• Behaviour analysis module generate report that helpful for both teachers and students for future improvement.
As our system generates the report, with the help of this report faculty can analyze the lecture was interesting for students or not. How many students where active and thus make change in syllabus accordingly so that maximum students are actively involved.

Sources	Similarity
Found YESTERDAY FRAMED IN TODAY on tw.polwantmand.asia Suppose Christ had come to earth, not two thousand years ago but in modern times? How would people receive him? For author Isabella MacDonald Alden ... https://tw.polwantmand.asia/635.html	25%
How to get current date and time in Python? By the way, date.today() returns a date object, which is assigned to the today variable in the above program. Now, you can use the strftime() method to create a string representing date in different formats. Example 2: Current date in different formats https://www.programiz.com/python-programming/datetime/current-datetime	25%

From the above plagiarism reports we take average of all the reports.

2+9+7+7+5+4+4=5.42

Hence we can say that there is 5.45% of plagiarism and 94.57% unique.

To check the plagiarism we have used the following website:

https://smallseotools.com/plagiarism-checker