

# **PROJECT BASED LEARNING - I REPORT**

**ON**

**Student Attendance System using Face Recognition**

**REPORT SUBMITTED TOWARDS PARTIAL FULFILLMENT OF THE  
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**In**

**Information Technology**

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## **CERTIFICATE**

The project titled “**Student Attendance System using Face Recognition**” submitted to the Symbiosis Institute of Technology, Pune for the third-year project in **Information Technology** is based on our original work carried out under the guidance of **Dr. Swati Ahirrao**. The report has not been submitted elsewhere for the award of any degree or for any other research related activity.

The material borrowed from other sources and incorporated in the report has been duly acknowledged and/or referenced.

We understand that we could be held responsible and accountable for plagiarism, if any, detected later.

Date:

**Signature of the candidate**

**Research Guide**

**Head of the Department**

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## **ABSTRACT**

The Attendance system will remain the most difficult, time-consuming and primitive task in any organization as the teacher needs to call out the names of students and mark their attendance. In order to eliminate these problems, introduction of biometric systems can be helpful for the organization.

The primary identification for any human is their face. Therefore, face recognition provides a system which is precise and overcomes the uncertainties like a proxy, high expenses, and time wastage. In this method, we propose a system that tabs the attendance of lectures by fixing the cameras in the classroom which capture the videos of the students using OpenCV and detects the faces of students present in the lecture by dividing the video into frames. The camera captures the images, and then an algorithm detects the faces and encodes them. It then recognizes the person and marks the attendance in the database and converts it into a .csv file.

OpenCV is a library used for video and image processing. The dlib library is also used in our project and it contains an application of "learning deep metrics" which is used to create face encodings used in the actual face recognition process. The face recognition library is used for face recognition and is very easy and simple to understand and work with. The goal of this project is to update the existing design by adding some additional features such as large data storage and fast computing with less hardware cost.

This report first introduces the topic of this project and gives a brief overview of this project. Then, it reviews the literature survey done by us before starting with the actual project followed by the scope, objectives and hardware/software requirements. Then, it introduces the system design, structure and plan. Finally, we move on to the implementation part of the project, which is the code and output. The results show that continuous monitoring improves the performance of this attendance system.

Keywords: Face Recognition, Face Detection, Machine Learning, Database, OpenCV, dlib, Camera, Attendance System.

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# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 Overview**

The project has been made by students of Second Year B Tech. Information Technology: Aqsa Kazi, Sahil Gupta, Ishan Sinha and Anubha Gupta. After doing a lot of research on Facial Recognition and how it can be used to solve real world problems, a system to automatically mark a student's attendance in a class using facial recognition has been made.

### **1.2 Project Idea**

Attendance management is a hectic job when done by using the traditional methods of calling roll numbers or names. To solve this problem, a smart student's attendance system has to be implemented. Facial recognition systems are very much useful in many real-life applications. In our project, during the start all the students will be enrolled in the classroom by storing their images with a unique identity or PRN. During the time of attendance, the real-time images of the student sitting in front will be taken by the camera and the faces in those images will be then matched with the faces in the already pre-trained dataset model.

### **1.3 Motivation**

The motivation behind this proposed system is to simplify the means by which attendance is traditionally taken during lectures and save everyone's time. Making the use of ID cards or manually calling out attendance in a traditional way and writing it down on sheets is not quick and efficient and it becomes quite tedious. This system is able to detect the face count in the class and is also able to identify them from the stored database in our system.



## **CHAPTER 2**

### **LITERATURE SURVEY**

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Yohie Kawaguchi, et.al [1] has proposed a system which was based on some continuous observation and using facial recognition. A system was presented by him with an active student detecting method (ASD) which had two cameras placed on the wall in which one is a sensing camera which is used for estimation of seats inside the classroom and the other one is a capturing camera for facial detection. They proposed a shooting plan in which one of the seats is estimated from the seating area obtained by Active Student Detecting Method and then it directs the capturing camera to the seat and captures an image. The existence of students is estimated using the background subtraction and enters the frame subtraction.

B.Kavinmuthi, et.al [2] has introduced an automated system which is based on the convolutional neural networks and has used the GSM module to send the generated attendance report to some authorized person. The convolutional neural network was modified by adding 2 normalization operations to two of the layers mentioned which provides the batch normalization acceleration of the network given. The facial recognition system is designed using the Scale-Invariant Feature Transform called as SIFT algorithm. The attendance will be taken by the system using MATLAB software. The image will then be captured and matched with the given database and an SMS is sent to the authorized number. The major steps that are being performed in this approach for generating the features are scale-space extrema detection, keypoint localization, orientation assignment, and keypoint descriptor, respectively.

Shubhobrata Bhattacharya, et.al [3] has used the CNN to obtain the low dimensional features as the pre-processed images are very high dimensional for some classifier to take it as an input directly. For facial detection, they have used Viola and Jones algorithm and further used correlation tracker to track given face from frame to frame. He has already worked on several parameters like resolution, sharpness, pose estimation, and brightness. The head position is determined by using the three-angle roll, yaw, and pitch. The approach is including a final score calculation which is called face quality assessment by assigning weights to the parameters.

## **CHAPTER 3**

### **PROBLEM STATEMENT AND OBJECTIVES**

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#### **3.1 Problem Statement**

Attendance is an important part of the daily classroom evaluation. During the start and end of a class, the teacher cross checks it, but it may appear that a teacher might have made some mistake which can lead to proxy or some students can be missed. Facial recognition-based attendance system is an automated technology for recognizing faces and taking attendance of the students by the applications of Artificial Intelligence and Machine Learning algorithms.

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#### **3.2 Scope and Objectives**

##### **3.2.1 Scope**

- The aim of this project is to replace the traditional method of taking manual attendance by an automated advanced technique of face recognition to identify people and storing attendance in the database.
- This project targets to benefit the organization where attendance monitoring is required like educational institutions.
- The database can store the faces of people and can be used to identify 1 person at a time.

##### **3.2.2 Objectives**

- The project aims to reduce time wastage.
- The vital objective is to utilize the latest trends in machine vision.

- The whole process to be automated is a goal.
- Prevents proxy attendance of students.
- The use of technology is encouraged by the means of the proposed project.

### **3.3 Hardware and Software Requirements**

#### **3.3.1 Software Requirement**

- 1) Operating System: Windows 11 64 bit
- 2) Platform: Python
- 3) Technology: Dlib, Numpy, OpenCV, Face Recognition, OS, Datetime libraries
- 4) IDE: Visual Studio Code 2019

#### **3.3.2 Hardware Requirement**

- 1) Processor: Intel® i5 (Quad core) or better
- 2) Hard Disc: 200 GB
- 3) RAM : 2GB
- 4) 2MP WebCam

## CHAPTER 4

### SYSTEM DESIGN

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#### 4.1 ARCHITECTURE DIAGRAM

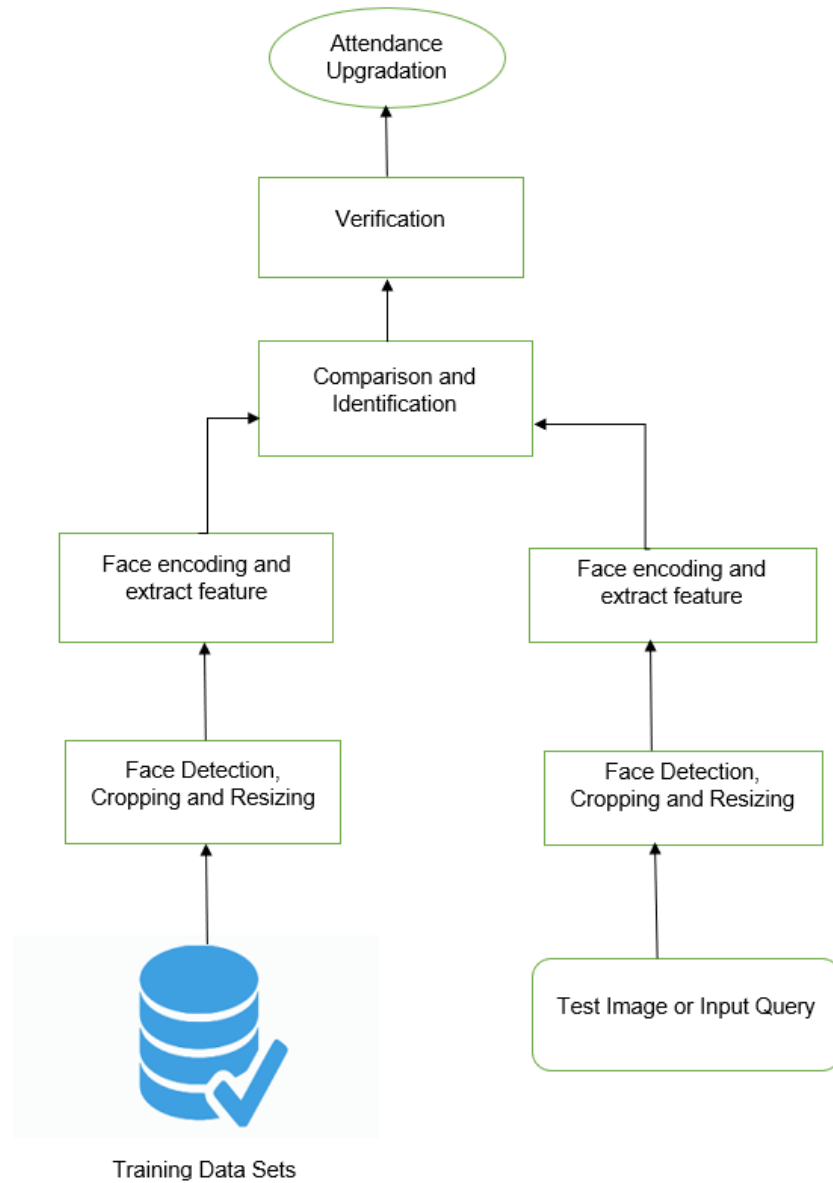


Figure 1 Architecture diagram

## 4.2 UML DIAGRAMS

### 4.2.1 DATA FLOW DIAGRAMS

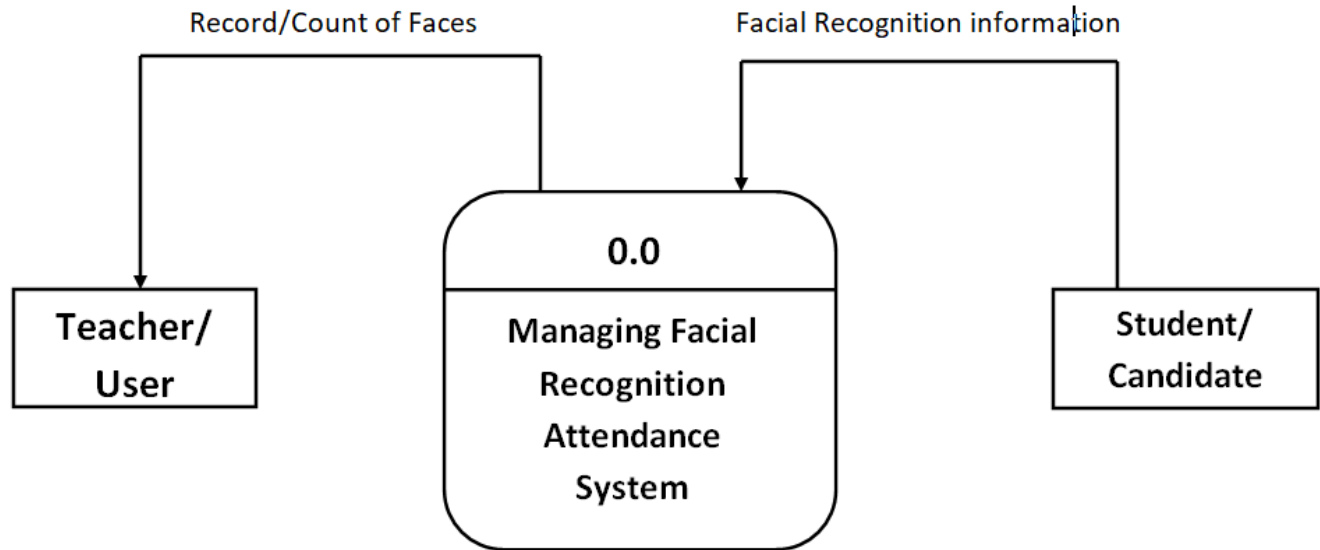


Figure 2 DFD Level 0

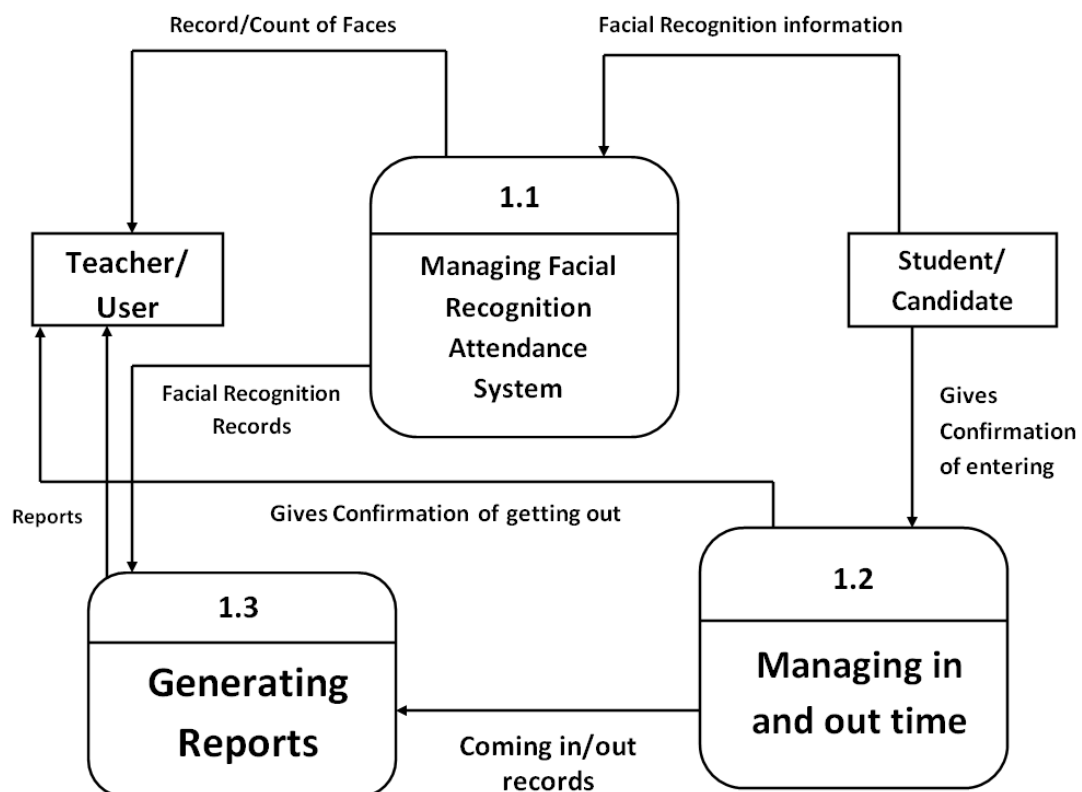


Figure 3 DFD Level 1

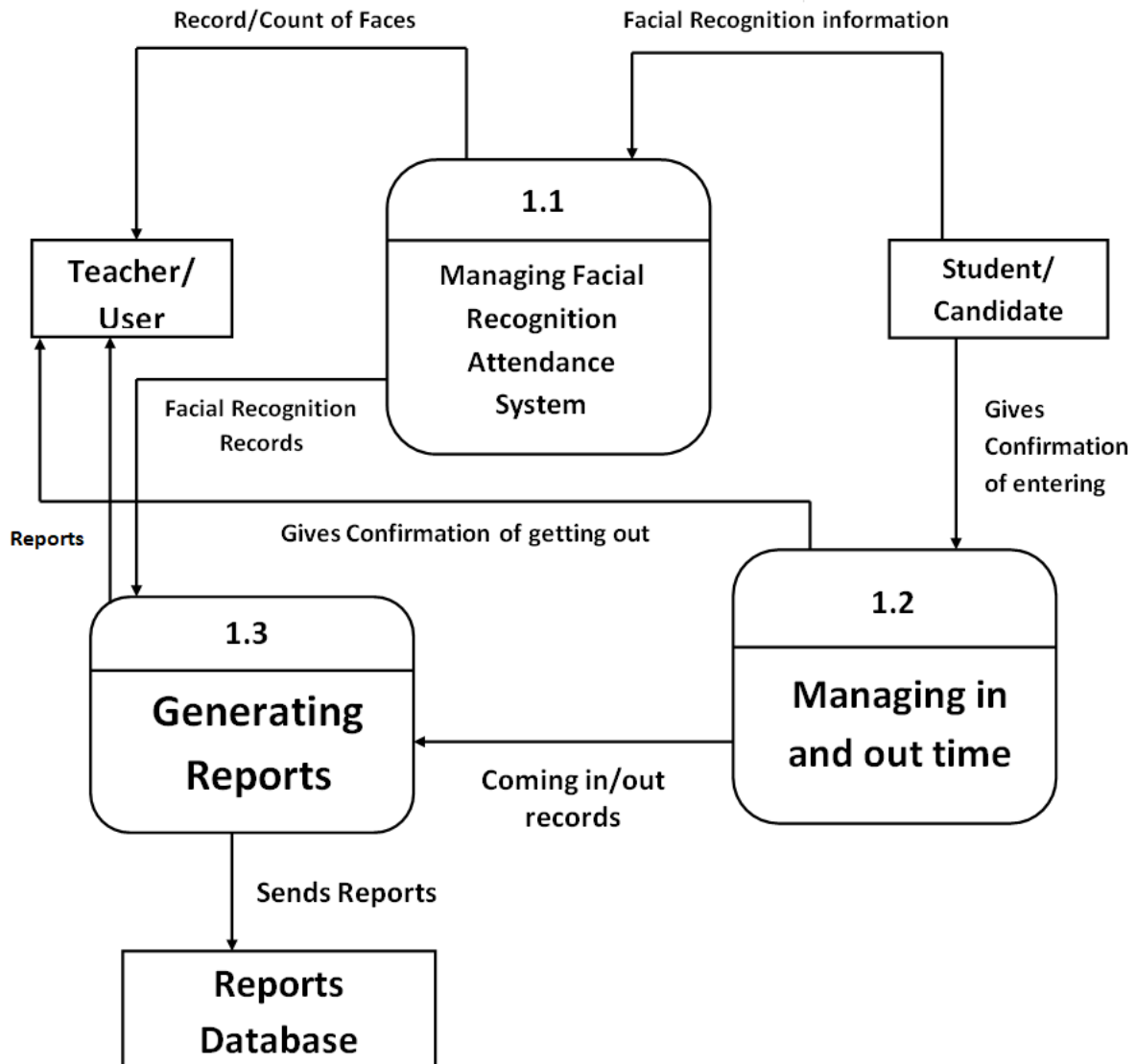


Figure 4 DFD Level 2

## 4.2.2 USE CASE DIAGRAM

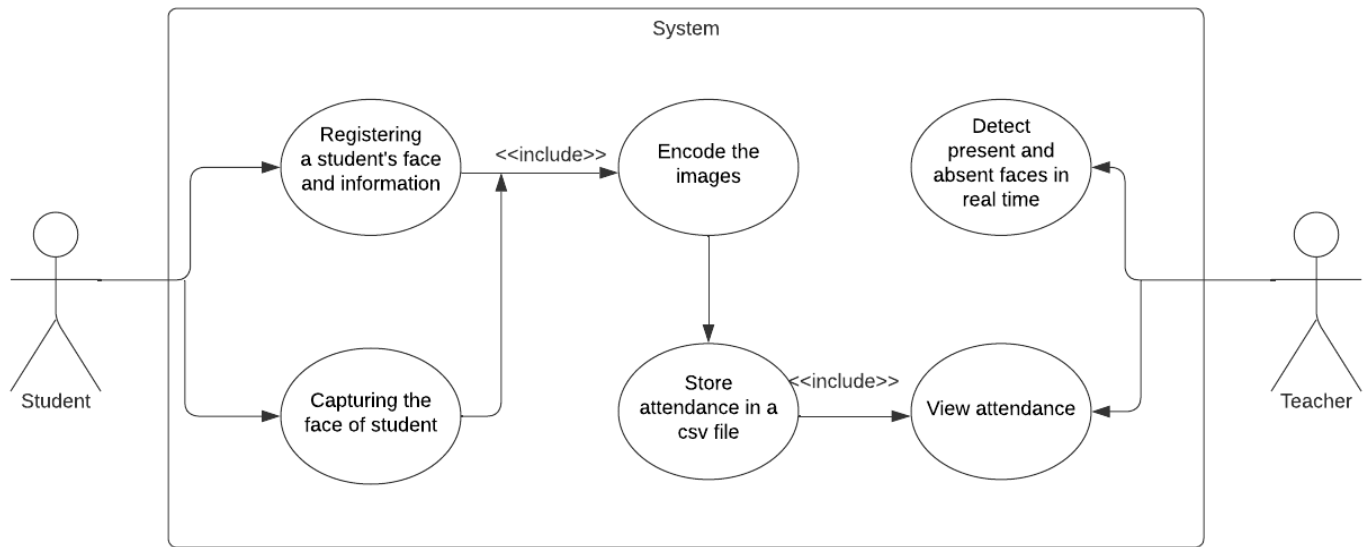


Figure 5 Use Case Diagram

## 4.2.3 ACTIVITY DIAGRAM

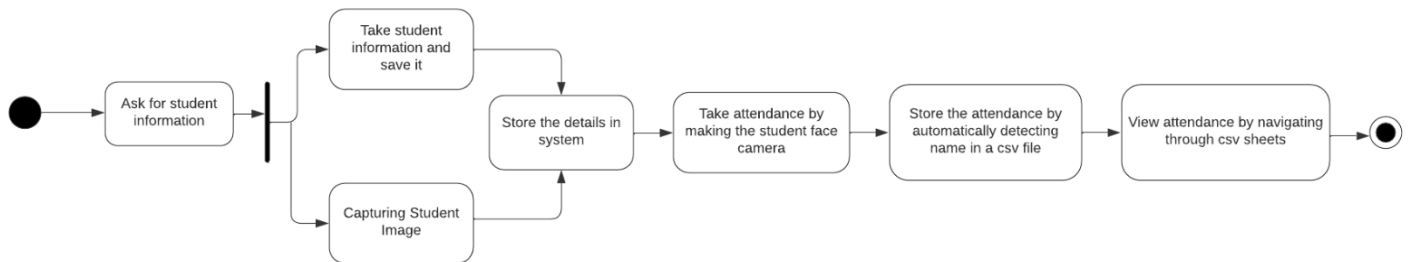


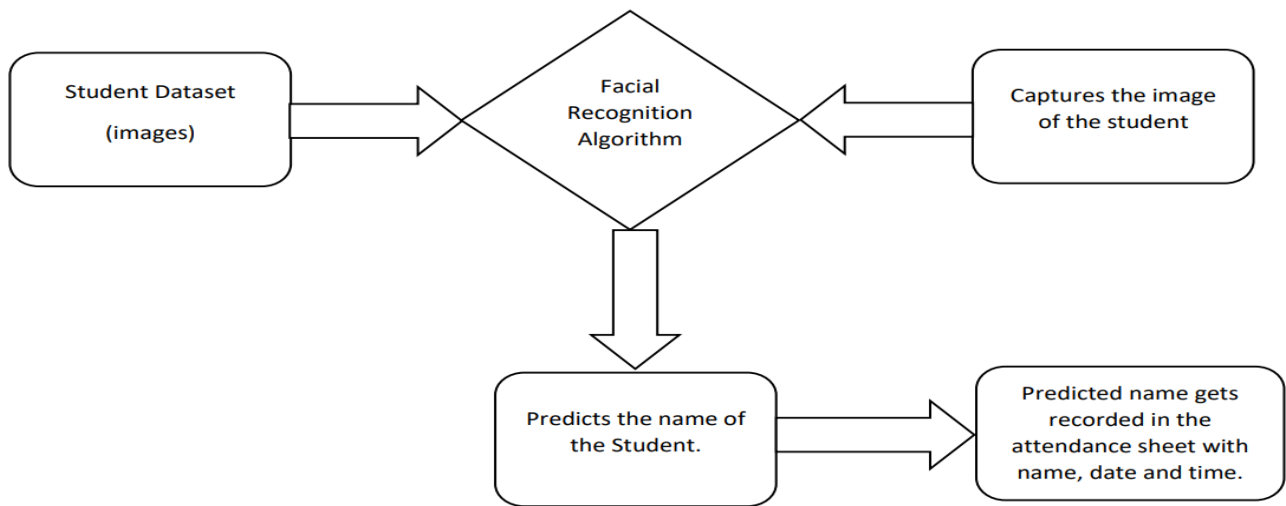
Figure 6 Activity Diagram

## CHAPTER 5

### IMPLEMENTATION

#### 5.1 IMPLEMENTATION METHODS

Proposed Methodology can be depicted with the below mentioned figure 7



**Figure 7 Proposed Methodology Diagram**

Face recognition algorithm is a way to build a biometric face model for further analysis and face recognition process. In our proposed face recognition project, we have used two major libraries; that is, OpenCv and face recognition. OpenCV uses machine learning algorithms to search for faces within a picture already stored in the database. We have used various OpenCV functions in our face recognition project like `cvtColor`(to convert image from BGR to RGB) , `resize`(to resize the image frame into particular size), `imread`(to read image), `imshow`(to show image), `rectangle`(to put rectangle on a detected face) etc. Face recognition library provides many useful inbuilt methods like face locations which locate the coordinates as mentioned (left, bottom, right, top) of every face detected in the image. Using location values, we can easily find the face encodings. It also provides a method called face encoding to find the matrix of every face detected.



## 5.1 Algorithms

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### Algorithm 1: Student Attendance System using Facial Recognition

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// Input: Video Frame and info data

// Output: Student info and image detected

**Step 1.** Start.

**Step 2.** Import libraries (OpenCV, Numpy, Face\_Recognition, OS, datetime)

**Step 3.** Store all the images.jpg in a list called myList.

**Step 4.** Use a for loop to read all the images using the imread function.

**Step 5.** Store name of person in a list called personNames.

**Step 6.** Create a user defined function called faceEncodings() to encode a face and append it to list called encodeList.

**Step 7.** Create a user defined Attendance function which will take the name of a person as argument and add attendance in the 'attendance.csv' file which will include date & time.

**Step 8.** Capturing a user video using the VideoCapture function.

**Step 9.** Start an infinite while loop, and inside a loop resize all the images into a particular frame size and convert images from BGR to RGB.

**Step 10.** Comparison of the encoded face and Current camera face and find its face distance using face\_distance function.

**Step 11.** Find the index of minimum face distance using numpy argmin() function and stored it in matchIndex.

**Step 12.** If the face matches and the person's name is not present in attendance.csv file, then update name, date and time in a file.

**Step 13.** Use destroyAllWindows() function to destroy all windows.

**Step 14.** Face recognition library is based upon dlib which has pretrained CNN neural network.

**Step 15.** End.

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**Algorithm 2:** Inbuilt library functions and their methodology of implementation.

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// Input: Video Frame and info data

// Output: Student info and image detected

**Step 1.** Start.

**Step 2.** Read all the images present in a directory using imread function of OpenCV

**Step 3.** Resize images into a particular frame size.

**Step 4.** Convert all the provided images from BGR to RGB using the cvtColor() function listed.

**Step 5.** Locates the coordinates of the face using face\_locations() function of face\_recognition library.

**Step 6.** Encode all the faces using face\_encoding() function.

**Step 7.** Capture video of the user using the videoCapture() function and convert it to RGB.

**Step 8.** Compare the encoded face and current camera face of the user and find the distance using the face\_distance function of face\_recognition library.

**Step 9.** Store the index of minimum distance in a variable using argmin function of numpy library.

**Step 10.** Use the imshow function and pass window\_name and image to it accordingly.

**Step 11.** Update the attendance sheet (.csv file) with the person's name, date and time.

**Step 12.** End.

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## CHAPTER 6

### RESULTS AND DISCUSSION

The proposed system is built on a python-based windows machine with Visual Studio Code as IDE. dlib library is used in this project which provides HOG + SVM face detector and also pre-trained CNN facial detector. Before feeding the face images to the neural network, all the images are cropped and aligned to achieve high accuracy in face recognition. The Convolutional Neural Network extracts 128-dimensional vectors of faces from the aligned images. After encoding all the images of the dataset, the camera takes the input of the user and then the frame is compared with previously encoded images in the dataset to recognize the name of the student. After recognizing the face, attendance is marked automatically in the attendance sheet.

**Images showing the process of face recognition and simultaneously marking the attendance in the sheet.**

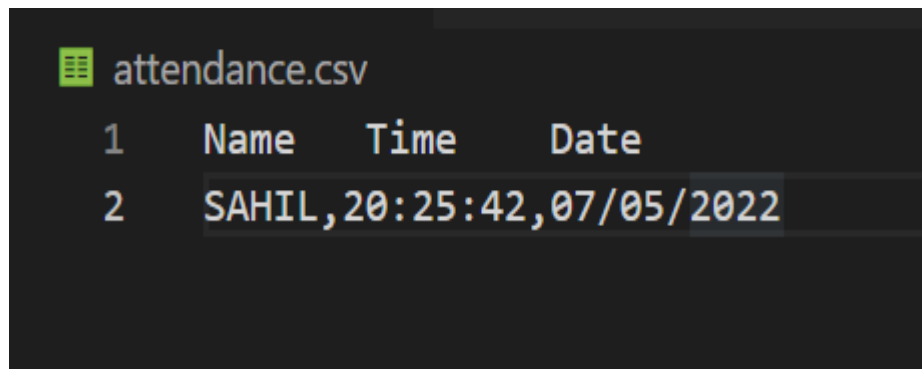


(a)



(b)

**Figure 8 (a) image shows the face of a student taken from the dataset. (b) image showing the detection and recognition of students which is collected from a live web camera.**



The image shows a code editor window with a dark background. At the top left, there is a green icon of a document with lines, followed by the text 'attendance.csv'. Below this, there is a table with two rows. The first row has four columns: '1', 'Name', 'Time', and 'Date'. The second row has four columns: '2', 'SAHIL', '20:25:42', and '07/05/2022'. The second row is highlighted with a light blue background.

1	Name	Time	Date
2	SAHIL	20:25:42	07/05/2022

**Figure 9** shows the attendance of the student recorded in the .csv file when face is recognized by the system.

## **CHAPTER 7**

### **CONCLUSION AND FUTURE SCOPE**

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The face recognition library is used to create a face recognition attendance system that can be useful in offices, schools or anywhere else. It reduces manual work and automatically updates records of attendance. This also marks the in time and thus can get information about people arriving late after a certain time.

This methodology is less time consuming and significantly reduces work of the administration by replacing traditional systems. As the data is stored electronically in the database so the risk of tampering is minimized to a great extent.

Future work is to improve the level of recognition of algorithms in the event of unintended changes in a person such as a depilated head, scarf, or beard. The advanced system detects a variety of angles that need to be continuously improved. This program can also be used at ATMs to prevent fraud. It can also be used to identify duplicate voters. In addition, it can also be used for a driver's license, passport and visa verification and for criminal identification.

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