A minor Project Final Report on

Face Recognition Based Student Attendance System in Python using OpenCV with Tkinter GUI

Submitted in Partial Fulfillment of the Requirements for the Degree of

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At the end we would like to express our sincere thanks to all the friends and others who helped us directly or indirectly during this project work.

ABSTRACT

Automatic Face Recognition (AFR) technologies have made a lot of improvements in the world of science and technology. The main purpose of this project is to build a face recognition-based attendance monitoring system for educational institution to enhance and upgrade the current attendance system into more efficient and effective as compared to before. The current old system has a lot of ambiguity that caused inaccurate and inefficient of attendance taking. Face recognition-based attendance system is a process of recognizing the faces of the students while taking attendance by using face bio-metrics based on high – definition monitor video and other information technology. In our face recognition project, a computer system will be able to find and recognize human faces quickly and precisely in images or videos that are being captured through a webcam / a surveillance camera. Here, faces will be recognized using face recognition algorithm. The processed image will then be compared against the existing record and then attendance marked in the database accordingly. The human face is the most distinctive feature used to uniquely identify an individual. Therefore, it is used to trace identity as the possibilities for a face to deviate or being duplicated is low.

Key Words: Face detection, Face Recognition, spreadsheet, Python, OpenCV, Tkinter GUI

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LIST OF ABBREVIATION

AFR	Automated face recognition
CNN	Convolution Neural Network
GUI	Graphical User Interface
LBPH	Local Binary Pattern Histogram
MYSQL	My Structured Query Language
RAM	Random Access Memory
ReLU	Rectified Linear Units
RFID	Radio frequency identification
SQL	Structured Query Language
OpenCV	Open Computer vision

1 INTRODUCTION

The technology aims in imparting a tremendous knowledge oriented technical innovation these days. Generally, in the classroom the attendance was taken by the teachers manually at the beginning and ending of the class. The problem with this approach is that it requires some time to take attendance and the manual process will have chances to make mistakes in most of the cases. To overcome that problem, RFID (Radio Frequency Identification) was introduced in the past years. But those are also having the fail proof of attendance system. So, we are introducing the concept of Face Recognition Based Student Attendance System. The main objective of proposed system is to allot attendance to the students using face recognition-based algorithms to achieve fail proof attendance system.

Face detection is used for many applications for the identification of human faces in digital images or video. It is defined as specific case of object-class detection; where it is used to find the locations and sizes of all objects in an image that belong to a given class. The technology is can be able to predict fontal or near-frontal faces in a photo, regardless of orientation, lighting conditions or skin color.

Face Recognition is a form of biometric software that maps an individual’s facial features mathematically and stores the data as a face print. The software consists of Deep Learning algorithms to compare a live capture or digital image to the stored face print in order to verify an individual’s identity.

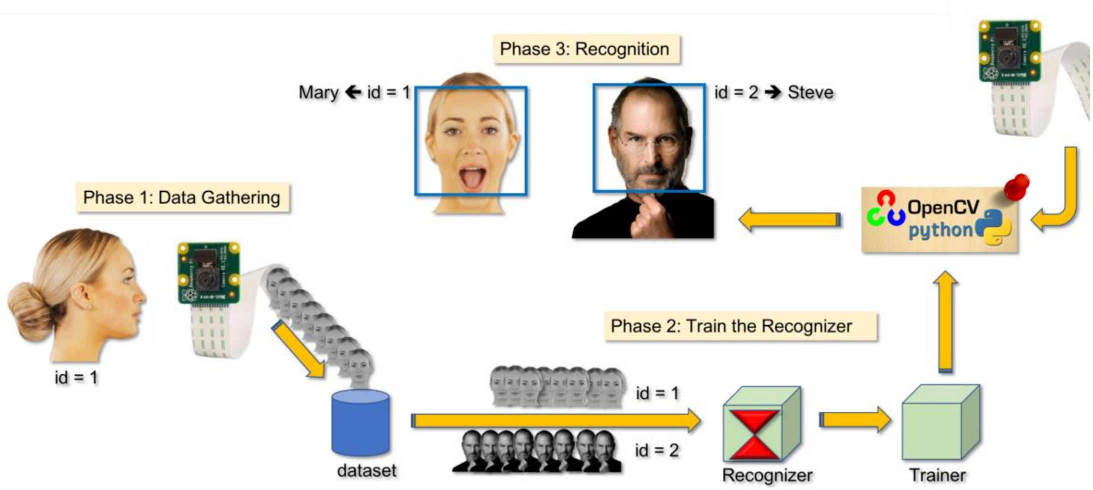


Figure 1 : Real time face recognization

1.1 Background

Maintaining the attendance is very essential in all the educational institutions for checking the performance of students. Many biometric systems are available in the market but the key authentications are same in all of the techniques. Every biometric system consists of enrollment process in which the unique features of a person is stored in the database and after that, there are some processes of identification and verification of the person. These two processes compare the biometric feature of a person with previously stored template captured at the time of enrollment of a student.

1.2 Problem Statement

1. According to the previous attendance management system, the accuracy of the data collected is the biggest issue. This is because the attendance might not be recorded personally by the original person, in another word, the attendance of a particular person can be taken by a third party without the realization of the institution which violates the accuracy of the data. For example, student A is lazy to attend a particular class, so student B helped him/her to sign for the attendance which in fact student A didn't attend the class, but the system overlooked this matter due to no enforcement practiced. Supposing the institution establish an enforcement, it might need to waste a lot of human resource and time which in turn will not be practical at all. Thus, all the recorded attendance in the previous system is not reliable for analysis usage. The second problem of the previous system is where it is too time consuming. Assuming the time taken for a student to sign his/her attendance on a 3-4 paged name list is approximately 1 minute. In 1 hour, only approximately 60 students can sign their attendance which is obviously inefficient and time consuming. The third issue is with the accessibility of those information by the legitimate concerned party. For an example, most of the parents are very concerned to track their child’s actual whereabouts to ensure their kid really attend the classes in college/school. However, in the previous system, there are no ways for the parents to access such information.

Therefore, evolution is needed to be done to the previous system to improve efficiency, data accuracy and provides accessibility to the information for those legitimate party.

1.3 Objectives

The proposed system will reduce the paperwork where attendance will no longer involve any manual recording. The new system will also reduce the total time needed to do attendance recording. The new system will acquire individual attendance by means of facial recognition to secure data accuracy of the attendance.

The following are objectives of the project:

- To develop a portable Smart Attendance System which is handy and self-powered.
- To ensure the speed of the attendance recording process is faster than the previous system which can go as fast as approximately 3 second for each student.
- To detect unique faces with the help of computer's camera
- Able to recognize the face of an individual accurately based on the face database.
- Allow parents to track their child's attendance.
- Develop a database for the attendance management system.
- Provide a user-friendly interface for admins to access the attendance database and for non-admins (parents) to check their child's attendance by mailing the attendance.
- Allow new students or to store their faces in the database by using a GUI

1.4 Project Features

1. Long term storage of records
2. High accuracy in calculation
3. Time saving
4. Optimize the resources
5. Efficiency in modification, sorting and retrieval of data
6. Inexpensive updating in facilities and terms of organizations.

1.5 Scope and Limitations

As with any technology, there are potential drawbacks to using facial recognition, such as threats to privacy, violations of rights and personal freedoms, potential data theft and other crimes. There’s also the risk of errors due to flaws int the technology. Though there are some weaknesses of this system, there is a tremendous scope in present world. Here we discuss about scope and limitations of our project.

1.5.1 Scope of project

1. The main intention of this project is to solve the issues encountered in the old attendance system while reproducing a brand new innovative smart system that can provide convenience to the institution.
2. Provides facility for the automated attendance of students.
3. An excel sheet is created which contains the student attendance and is mailed to the respected faculty.

1.5.2 Limitation of project

1. The main problem of face recognition is large variability of recorded image due to pose, illumination condition, facial expression, different hairstyles, presence of glasses, beard.
2. Difficulties in code writing.
3. Difficulty to overcome ambiguity.

2 LITERATURE REVIEW

2.1 Introduction

The literature review deals with the topics and the researches that would help to understand Face Recognition Based Student Attendance System from the existing systems that are similar to Face Recognition Based Student Attendance system. The objective of this literature review is to analyze the related work to this project and mechanisms used in previous studies.

2.2 Signature Based Attendance System

According to our first research, we have "Smart Attendance Management and Analysis with Signature Verification." This project is the Smart Attendance Management and Analysis System where after getting individual's signature of the student, the signature is scanned and converted into an image file. After segmentation, features are extracted from the signature. Verification of signature is made with the Database of student's Signature and Excel sheet of absence and presence of student's attendance is generated. Signature is one of the most popular and legally accepted biometrics used in one's person identification. A handwritten signature is one of the ways to verify person's identity in legal, financial and administrative areas. [1]

2.3 Fingerprint Based Attendance System Using Microcontroller and LabView

According our next research journal "Fingerprint Based Attendance System Using Microcontroller and LabView" proposed a solution of using fingerprint to mark the attendance. This system is using 2 microcontrollers to deal with the fingerprint recognition process. Firstly, the fingerprint pattern will be obtained through a fingerprint sensor, then the information will be transmitted to microcontroller 1. Next microcontroller 1 will pass the information to microcontroller 2 to do the checking with the database that resides in it. After finding a student's match, the details are sent to the PC through serial communication to be displayed. This design is good as it accelerates development while maintaining design flexibility and simplifies testing. But again, this system is attached to a PC which make it not portable. Other than that, the database information cannot be accessible easily.[2]

2.4 RFID Based Student Attendance System

RFID – Radio Frequency Identification is one method for attendance making. In this technology an individual has to carry his own RFID card. Therefore, this system is cost effective and can also give rise to fraud as any unauthorized person can use the card for fake attendance. [3]

2.5 Face Recognition Attendance System

This is one of the most efficient systems of all existing ones for identification of people. It can be used in school, colleges, or any organization. To avoid the difficulty of taking attendance of enormous number, there is a need of automated attendance system that is fast and reduces the chance of fake attendance. In this technology system is developed for deploying an easy and a secure way of taking down attendance. This attendance is recorded, by continuously detecting faces of employees or students via camera as they enter the classroom. The software first detects the faces and simultaneously compares them with the predefined database. [4]

2.6 Existing System

Here is the discussion of some existing systems:

2.6.1 Convolution Neural Network (CNN) based detector

CNN is a category of Neural Networks that have proven very effective in areas such as image recognition and classification.[5] A typical CNN, when provided with an input, applies one of the following four main operations on it:

- Convolution
- Non-Linearity(ReLU)
- Pooling or Sub Sampling
- Classification (Fully Connected Layer)

This method is of high accuracy only if large size of images were trained.

It has following demerits:

- Detection process is slow and computation is complex.
- Overall performance is weaker.

2.6.2 AdaBoost algorithm

AdaBoost can be used to boost the performance of any machine learning algorithm. It is best used with weak learners. These are models that achieve accuracy just above random chance on a classification problem. The most suited and therefore most common algorithm used with AdaBoost are decision trees with one level.[6]

Its merit is that it does not need to have any prior knowledge about face structure.

Its demerit is that the result highly depends on the training data and affected by weak classifiers.

2.6.3 SMQT Features and SNOW Classifier Method

This is capable to deal with lighting problem in object detection. It is also efficient in computation.

The disadvantage of this method is that the region contains very similar to grey value regions which will be misidentified as face.

2.6.4 Viola Jones Algorithm

Viola-Jones algorithm which was introduced by P. Viola, M. J. Jones (2001) is the

most popular algorithm to localize the face segment from static images or video frame. Basically, the concept of Viola-Jones algorithm consists of four parts. The first part is known as Haar feature, second part is where integral image is created, followed by implementation of Adaboost on the third part and lastly cascading process.[7]

Following are the advantages on using this algorithm:

- High detection speed
- High accuracy

Also, this algorithm has some demerits like long training time, limited head pose and not able to detect dark faces.

3 METHODOLOGY

3.1 Introduction

A methodology is a development system of methods that is used to plan, structure, and control the process of developing an information system. A wide variety of published development methodologies have evolved over the years, each with its own recognized strength and weakness. Different types of system project use available methodologies that best suits a specific project based on the project's various technical developmental process. Below are the types of methodologies applied in developing this project.

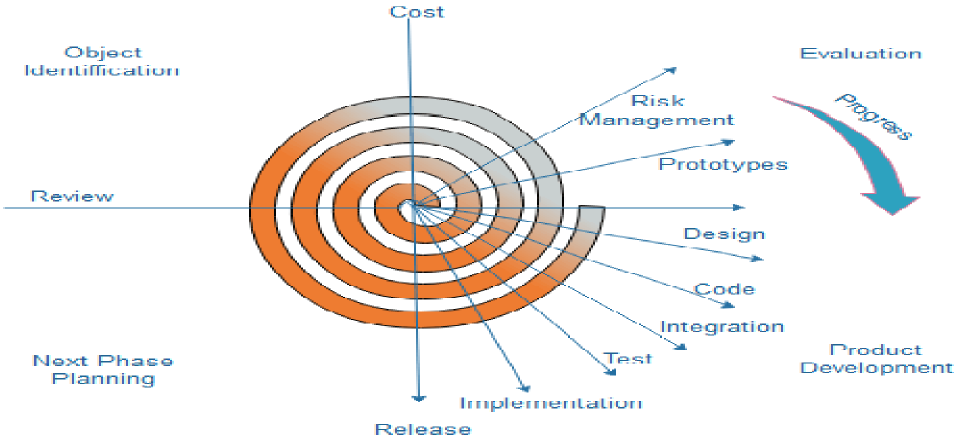


Figure 2: Spiral Model

The spiral model, initially proposed by Boehm, is an evolutionary software process model that couples the iterative feature of prototyping with the controlled and systematic aspects of the linear sequential model. It implements the potential for rapid development of new versions of the software. Using the spiral model, the software is developed in a series of incremental releases. During the early iterations, the additional release may be a paper model or prototype. During later iterations, more and more complete versions of the engineered system are produced. [8]

Each cycle in the spiral is divided into four parts:

Objective setting: Each cycle in the spiral starts with the identification of purpose for that cycle, the various alternatives that are possible for achieving the targets, and the constraints that exists.

Risk Assessment and reduction: The next phase in the cycle is to calculate these various alternatives based on the goals and constraints. The focus of evaluation in this stage is located on the risk perception for the project.

Development and validation: The next phase is to develop strategies that resolve uncertainties and risks. This process may include activities such as benchmarking, simulation, and prototyping.

Planning: Finally, the next step is planned. The project is reviewed, and a choice made whether to continue with a further period of the spiral. If it is determined to keep, plans are drawn up for the next step of the project.

3.2 Hardware and software requirement

3.2.1 Hardware Requirement

- Computer
- Internet
- Mouse
- Keyboard
- Minimum 128 RAM
- Minimum 500 MB hard disk

3.2.2 Software requirement

The software is the non-physical part of the system that uses the hardware components to successfully run the system that has been built. The system must have word processor. The system will run windows Operating System.

Operating system: Windows, Linux

Different software we used are:

Language	:	Python, OpenCV, Tkinter GUI
Database	:	MYSQL
Spreadsheet	:	Excel

3.3 Software Description

3.3.1 OpenCV

OpenCV is a Python open-source library, which is used for computer vision in Artificial intelligence, Machine Learning, face recognition, etc. The purpose of computer vision is to understand the content of the images.

3.3.2 HAAR-Cascade Detection in OpenCV

OpenCV provides the trainer as well as the detector. We can train the classifier for any object like cars, planes, and building by using the OpenCV.

There are two primary states of the cascade image classifier:

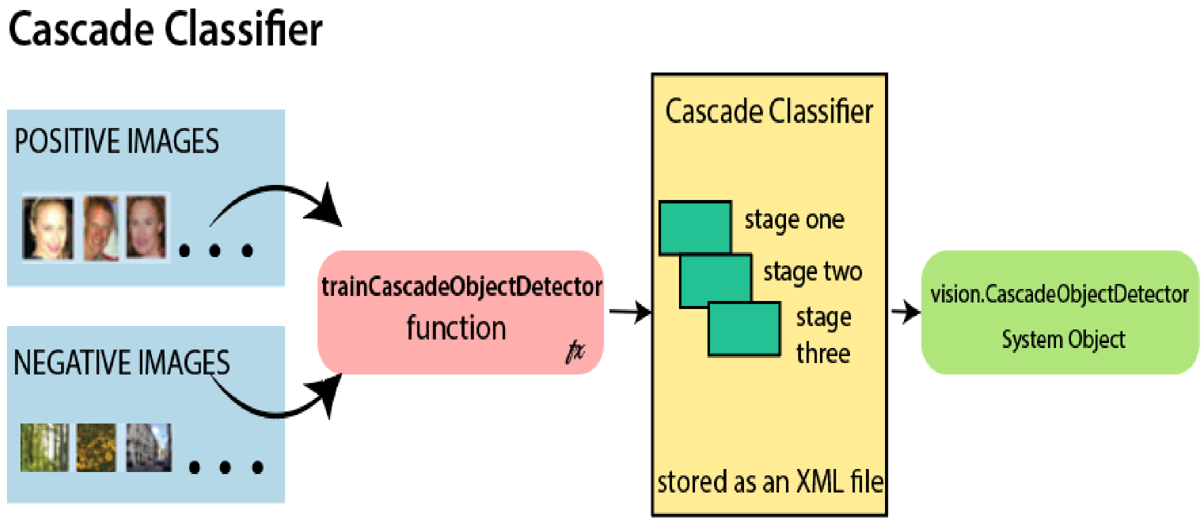
- first one is training and
- the other is detection.

OpenCV provides two applications to train cascade classifier **opencv_haartraining** and **opencv_traincascade.** These two applications store the classifier in the different file format.

For training, we need a set of samples. There are two types of samples.

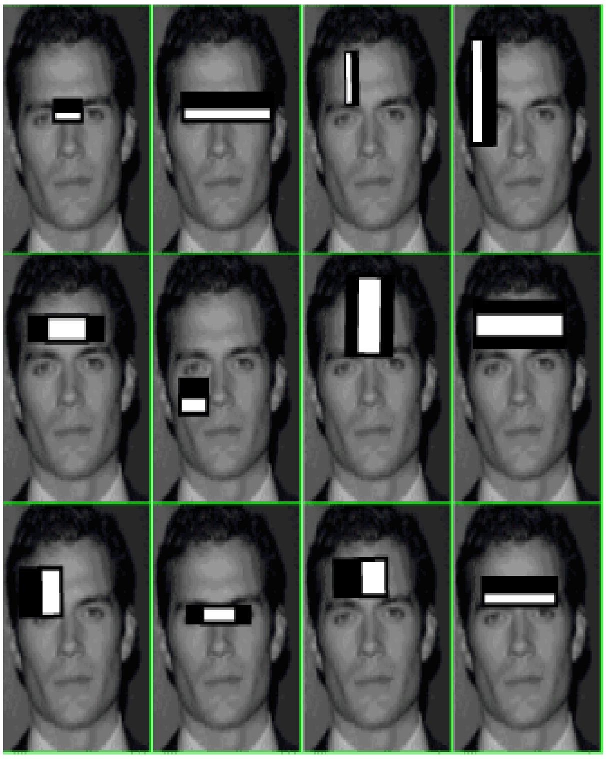
- **Negative sample:** It is related to non-object images.
- **Positive sample:** It is a related image with detect objects.

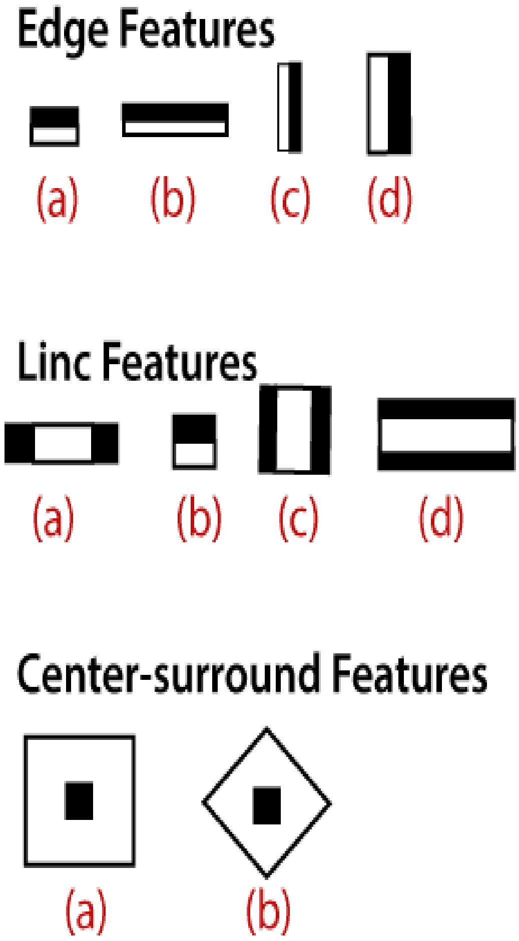
A set of negative samples must be prepared manually, whereas the collection of positive samples is created using the **opencv_createsamples** utility.



Steps of the Algorithm:

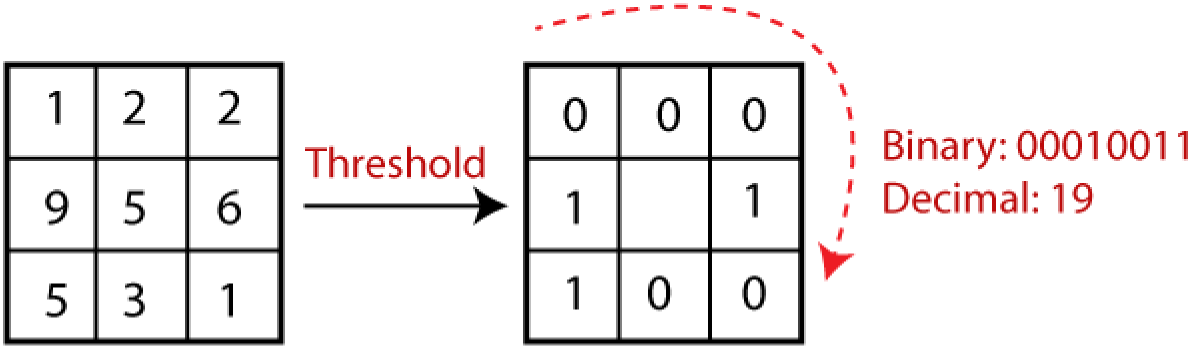
1. First, we need to load the necessary XML classifiers and load input images in grayscale.
2. After converting the image into grayscale, we can do the image manipulation where the image can be resized, cropped, blurred, and sharpen if required. The next step is image segmentation; identify the multiple objects in the single image, so the classifier quickly detects the objects and faces in the picture.
3. The haar-Like feature algorithm is used to find the location of the human faces in frame or image.
4. In this step, we extract the features from the image, with the help of edge detection, line detection, and center detection. Then provide the coordinate of x, y, w, h, which makes a rectangle box in the picture to show the location of the file. It can make a rectangle box in the desired area where it detects the face.





3.3.2 LBPH algorithm

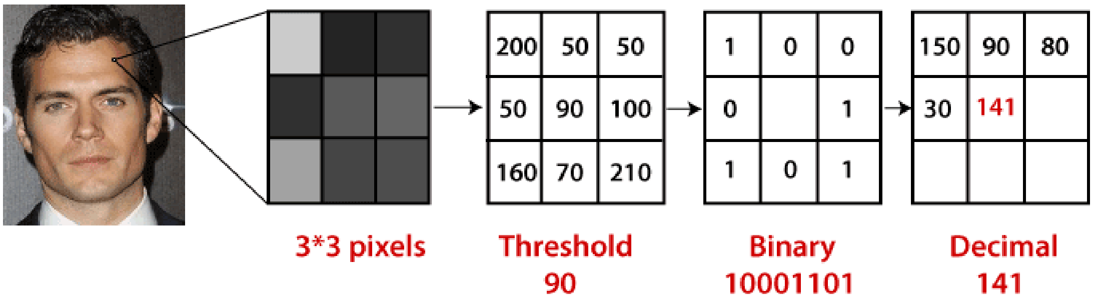
Local Binary Pattern Histogram algorithm is a simple approach that labels the pixels of the image thresholding the neighborhood of each pixel.



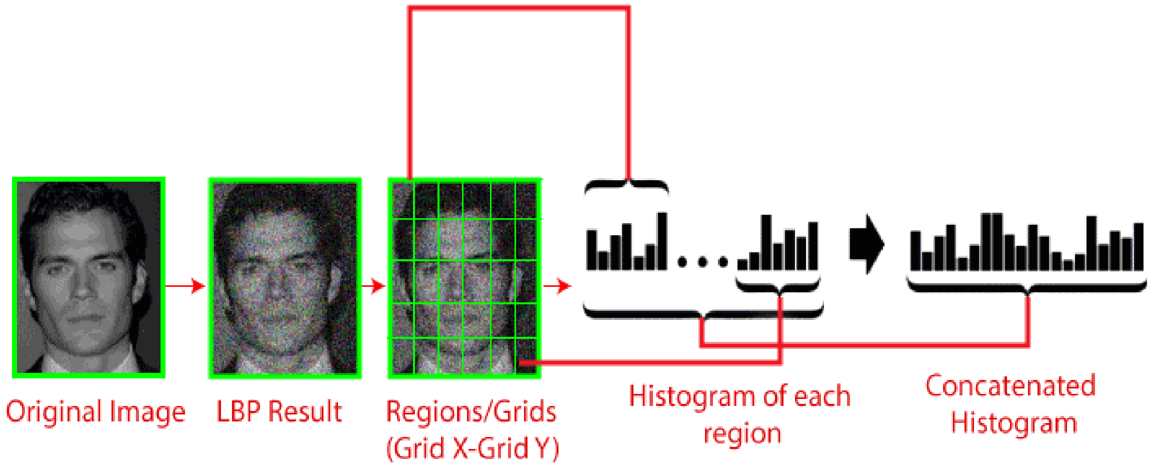
Steps of the algorithm:

1. Selecting the Parameters:

   -The LBPH accepts the four parameters: Radius, Neighbors, Grid X, Grid Y
2. Training the Algorithm
3. Using the LBP operation



4. Extracting the Histograms from the image



5. Performing face recognition:

   Use Euclidean distance based on the following formula:

$$D = \sqrt{\sum_{i=1}^{n} (\text{hist } 1_i - \text{hist}2_i)^2}$$

3.4 System analysis

Systems analysis is a process of collecting factual data, understanding the processes involved, identifying problems and recommending feasible suggestions for improving the functionality of the system. This involves studying the business processes, entity relationships gathering operational data, understand the information flow, finding out bottlenecks and evolving solutions for overcoming the weaknesses of the system to achieve the organizational goals. System Analysis also includes decoupling of complex processes that make up the entire system, identification of data store and manual processes.

3.5 System design

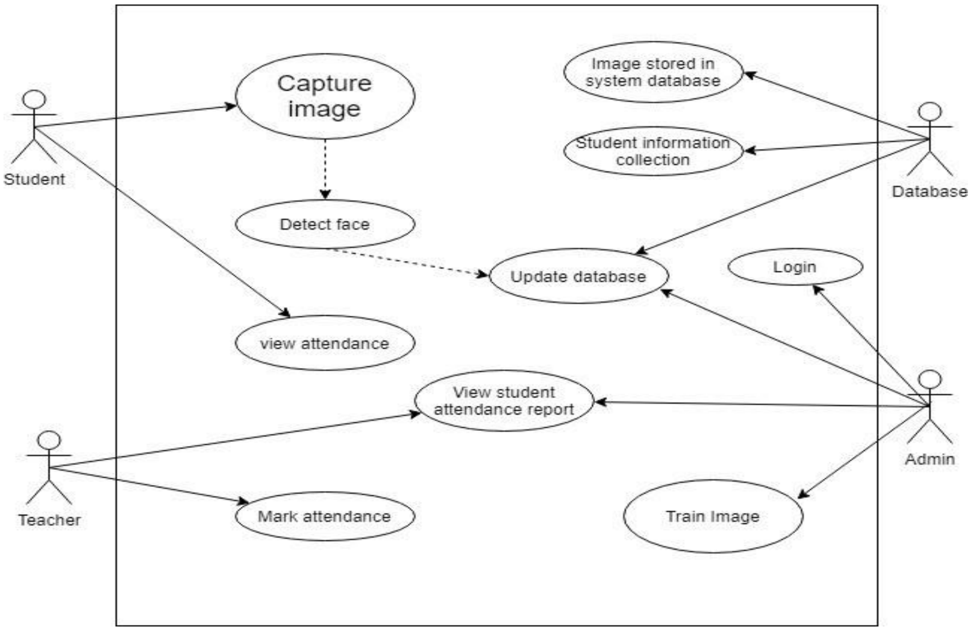


Figure 3 : Use-case diagram for Face recognition attendance system

3.6 Block diagram

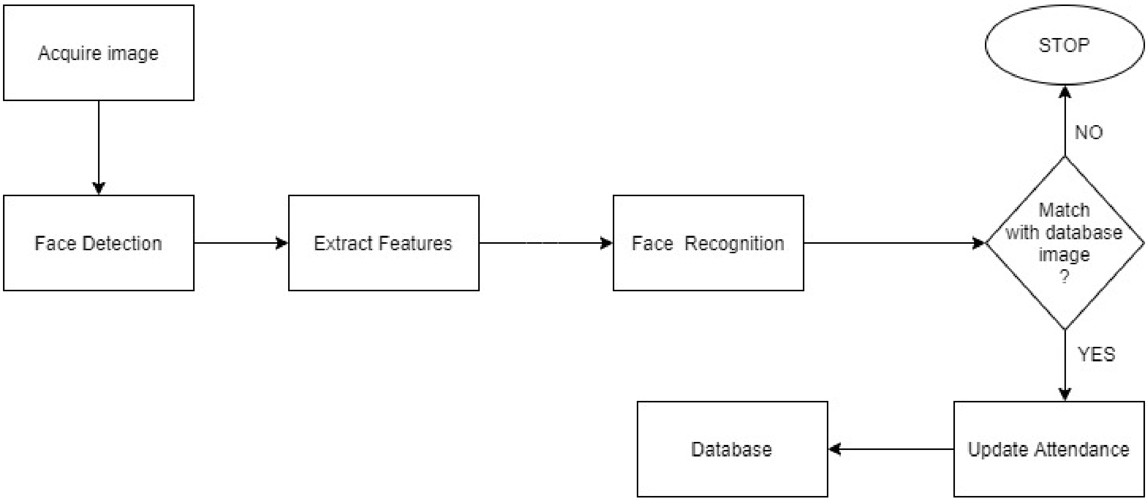


Figure 4: Block Diagram for Face recognition and detection-based attendance of student

3.7 Class Diagram

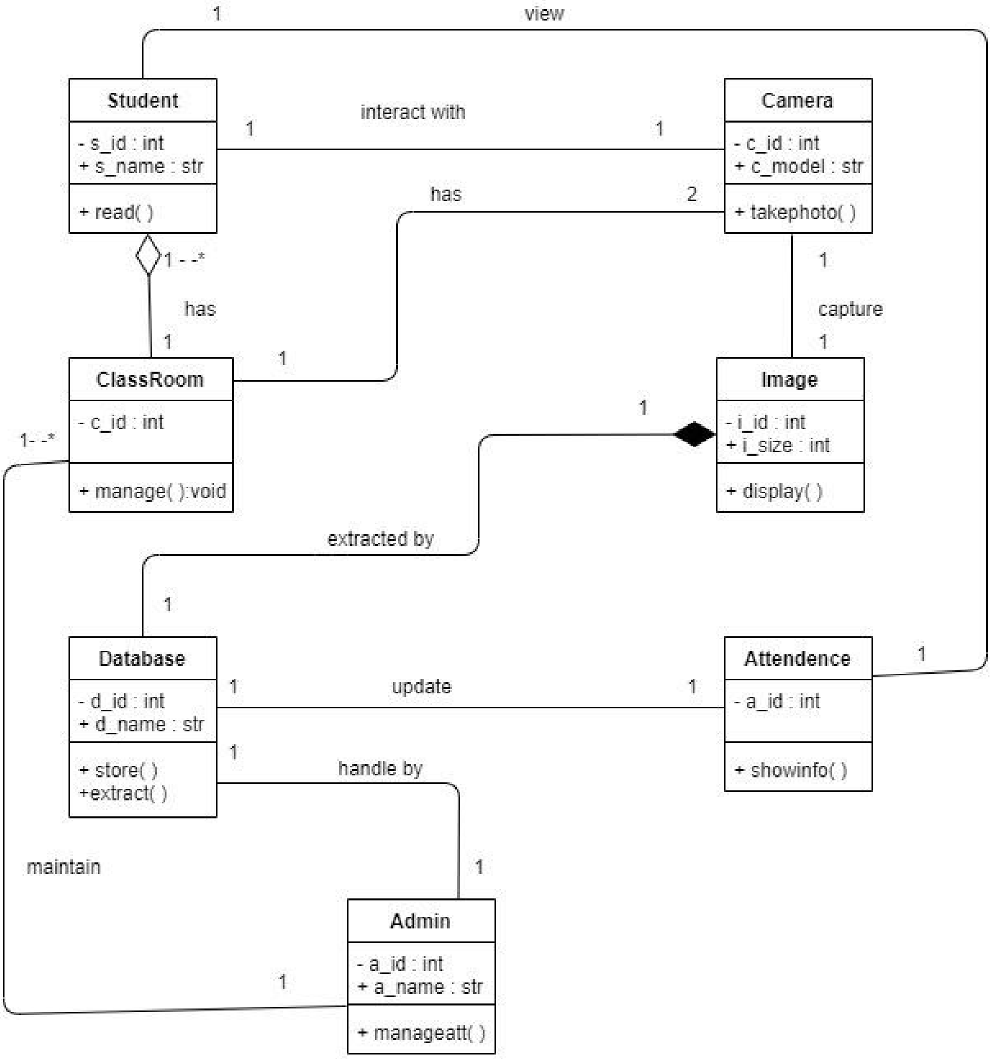


Figure 5 : Class Diagram for Face recognition attendance system

3.8 Entity Relationship diagram

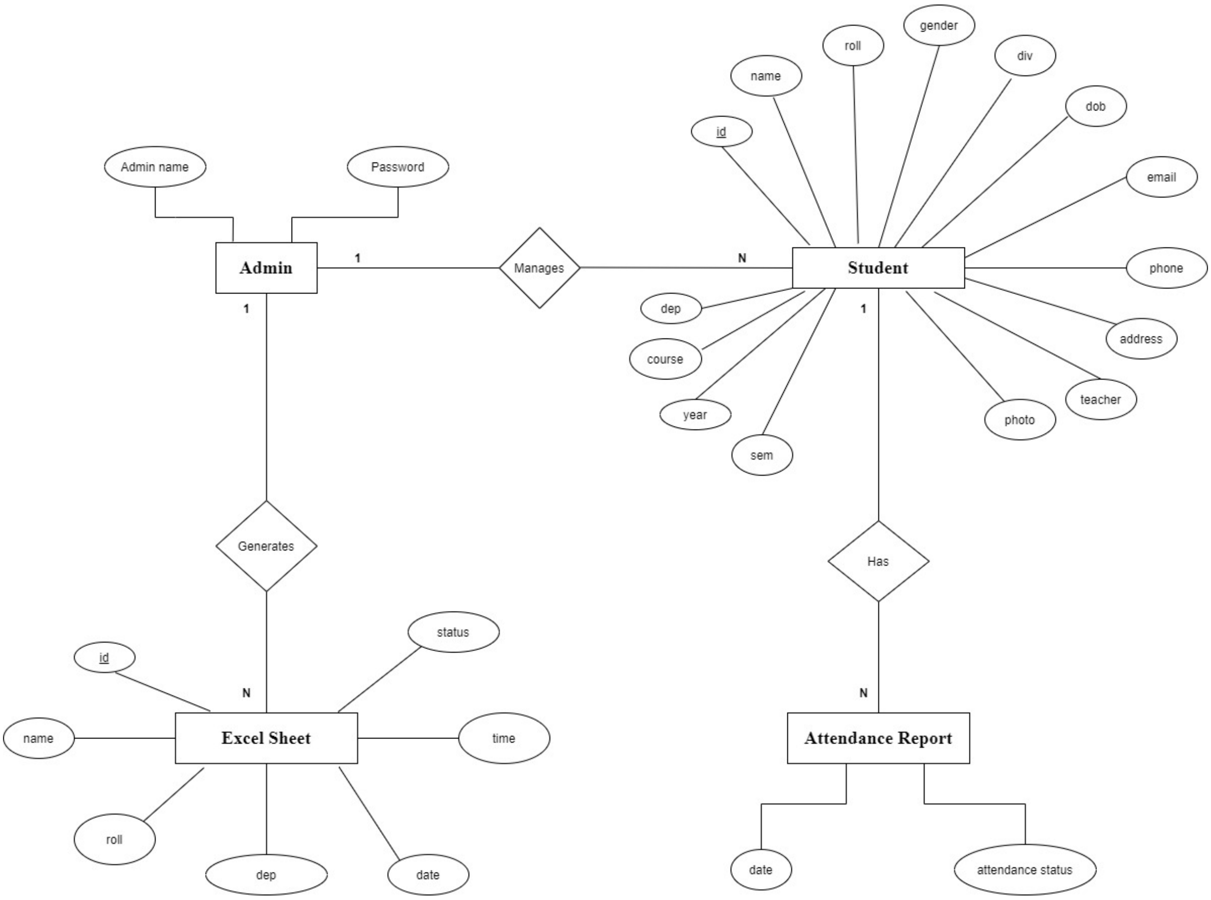


Figure 6: ER Diagram for Face recognition attendance system

3.9 Sequence diagram

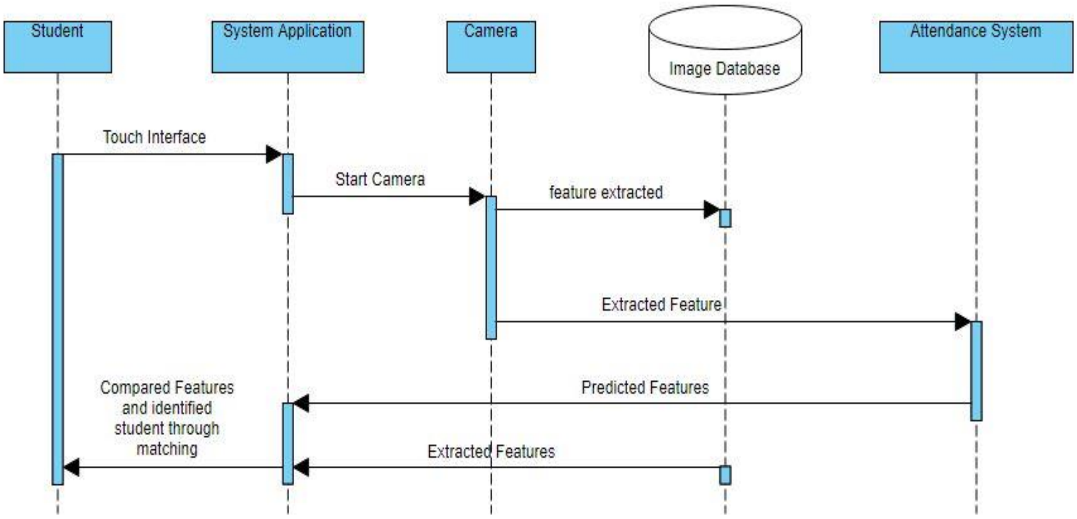


Figure 7: Sequence Diagram for Face recognition attendance system

3.10 Working principle

Algorithm: For Admin

```
Step1: START
Step2: Go to Home
Step3: Do you have a account?
        3.1: If yes, Login to account
        3.1.1: Go to the Home Page
        3.1.1.1: Manage Student Detail, Image Process and Manipulate
        3.1.1.2: Export the attendance detail
        3.1.1.2.2: No, exit
3.2: If no, register for the account and go to step 3
Step4: STOP
```

Algorithm: For Face recognition and detection-based attendance of student

```
Step1: START
Step2:  Image stored in Sys[i]tem data base
Step3:  Recognization Process start
Step4:  Camera Capture the User image
Step5: Compare With database image
        3.1: If Match
        3.1.1: Present to the student
        3.1.1.1: A file generated with student detail
        3.1.1.2: Export the attendance detail
        3.1.1.2.2: exit, go to step4
3.2: If no match, go to step 4
Step4: STOP
```

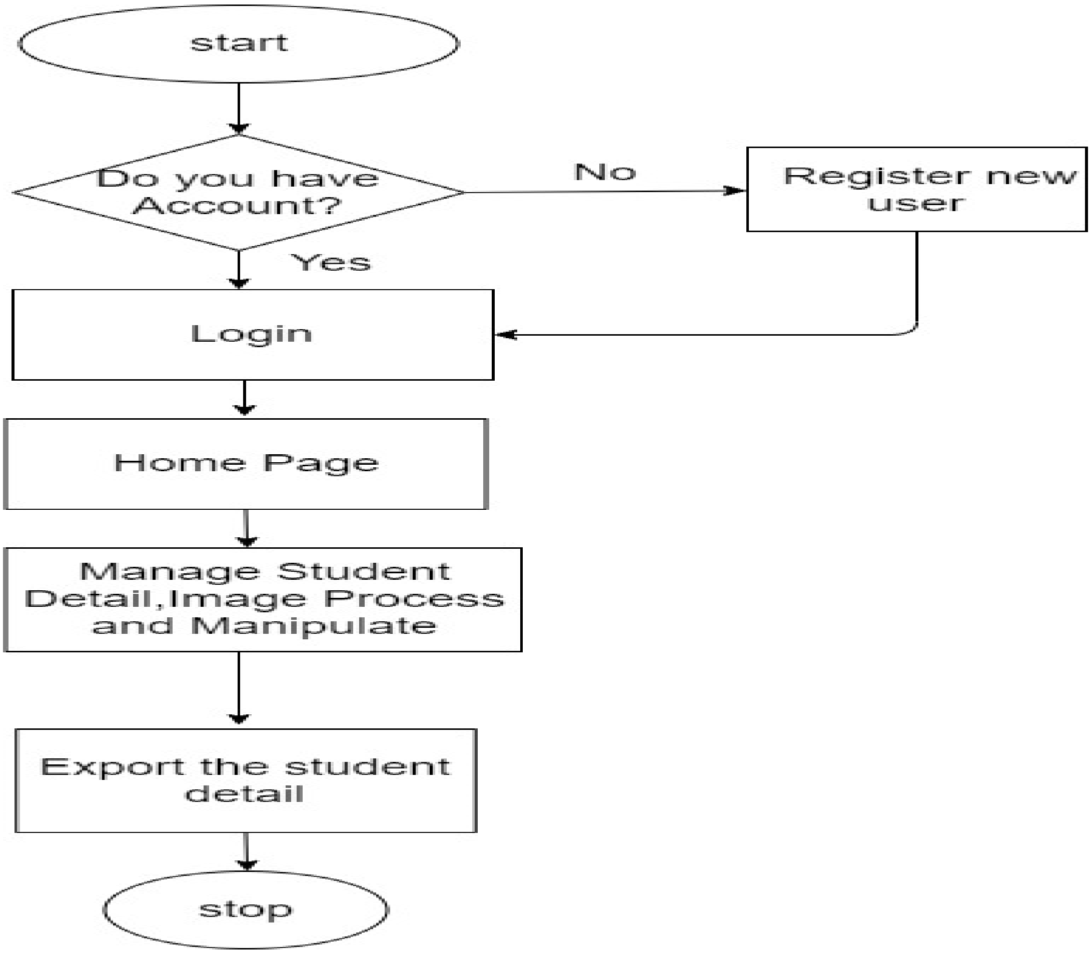

start
Do you have Account?
No
Register new user
Yes
Login
Home Page
Manage Student Detail,Image Process and Manipulate
Export the student detail
stop

Figure 8: Flow chart for Admin

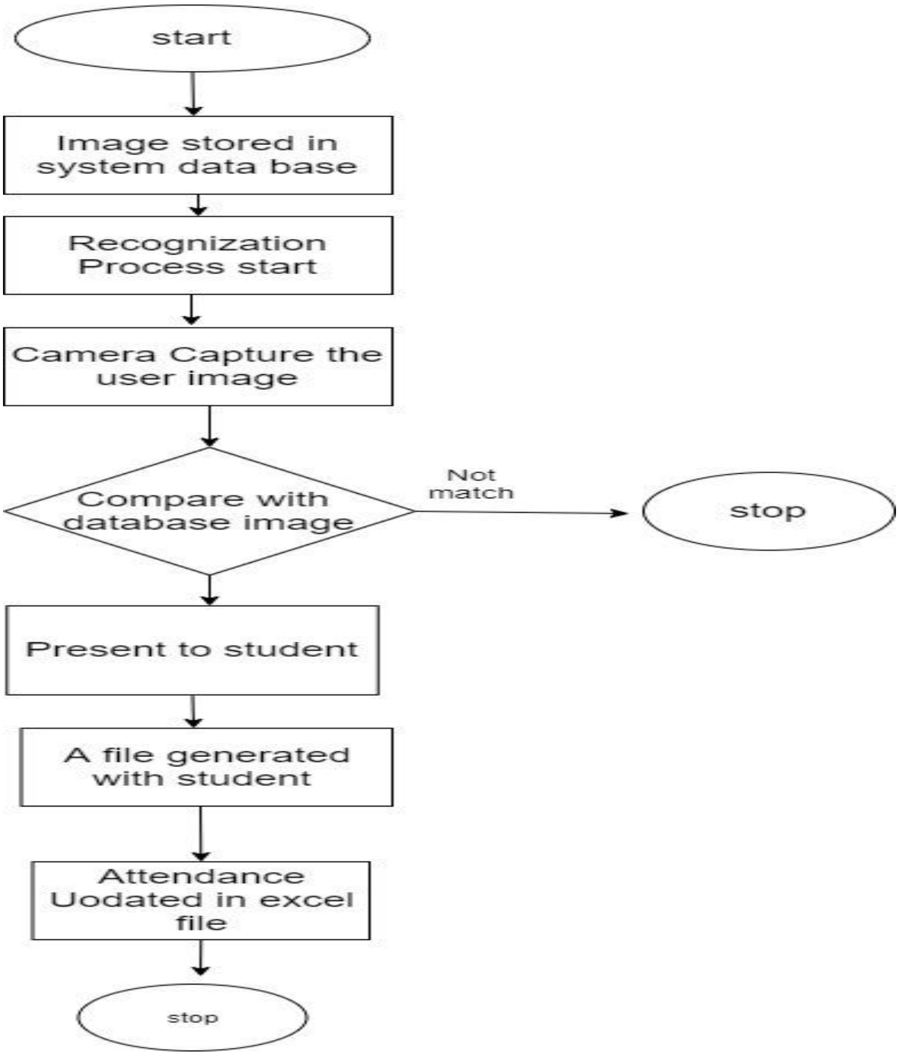

start
Image stored in system data base
Recognization Process start
Camera Capture the user image
Compare with database image
Not match
stop
Present to student
A file generated with student
Attendance Uodated in excel file
stop

Figure 9: Flow chart for Face recognition-based attendance system

4 WORKS COMPLETED

4.1 Works Completed

1. We can Register the new admin, and we can also reset the password.
2. We can view the home page of the project
3. We have taken the dataset and trained the dataset.
4. We have designed different types of diagrams like Use case Diagram, Class Diagram and Sequence diagram etc. for documentation
5. We can do the database part of the project.
6. Facial detection and recognition work have been completed.
7. Once face of the student is detected, it recognizes the student and marks attendance.
8. Tabular representation of attendance data is done generating a csv file.
9. Data can be retrieved easily.
10. Validation of the data.
11. Included voice-command.

4.2 Problems Encountered

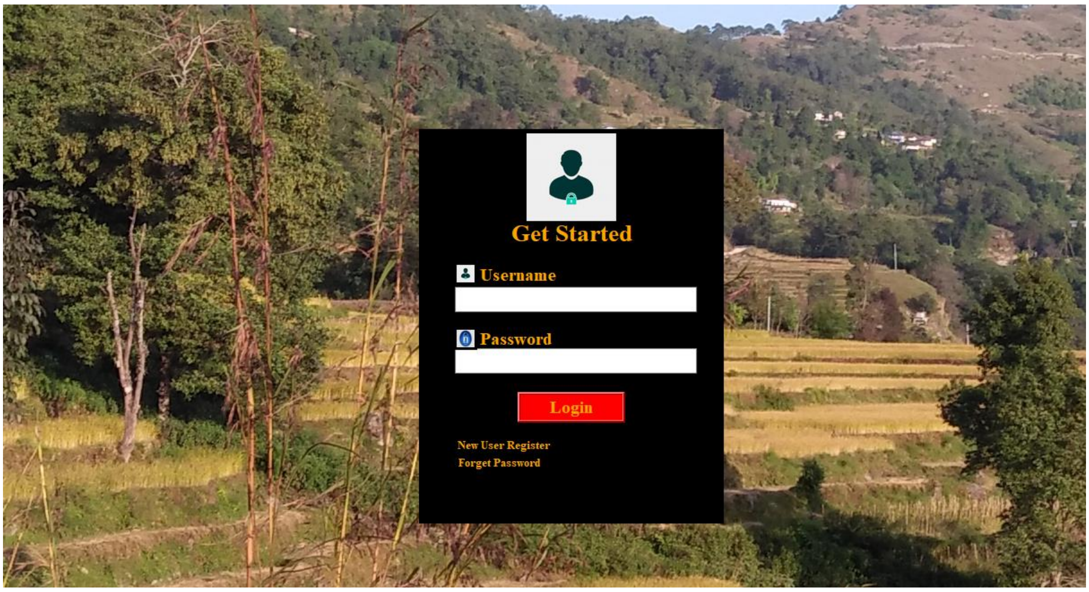
- The main problems of face recognition is large variability of recorded image due to pose, illumination condition, facial expression, different hairstyles, presence of glasses, beard.
- Difficulties in code writing.
- Difficulty to overcome ambiguity.
- It is often very difficult to maintain and update all the records and retrieve certain data.

5 RESULT ANALYSIS AND CONCLUSION

5.1 Result and Analysis

Over a span of 10 weeks, our team “kyzen” was successful in completing a proof of concept demonstrating an Attendance System based on Facial Recognition. The following screenshots in Appendices section of the application home page demonstrates the key functionality the application provides.

Output Screenshots:



Get Started

Username

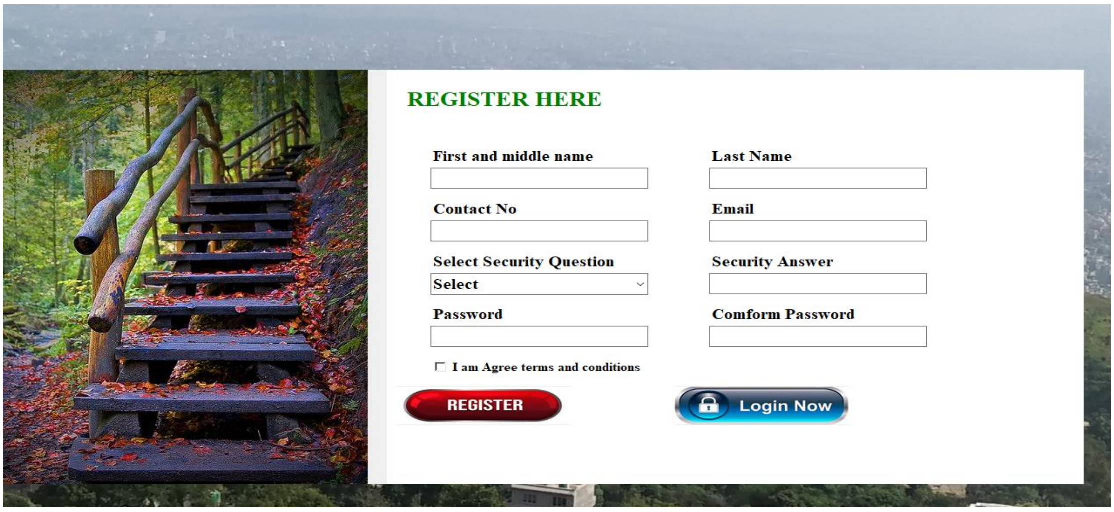
Password

Login

New User Register

Forget Password

Figure 10: Admin/User Login Home Page



REGISTER HERE

First and middle name

Last Name

Contact No

Email

Select Security Question

Select

Security Answer

Password

Comform Password

□ I am Agree terms and conditions

REGISTER

Login Now

Figure 11: New Admin/User Registration Page

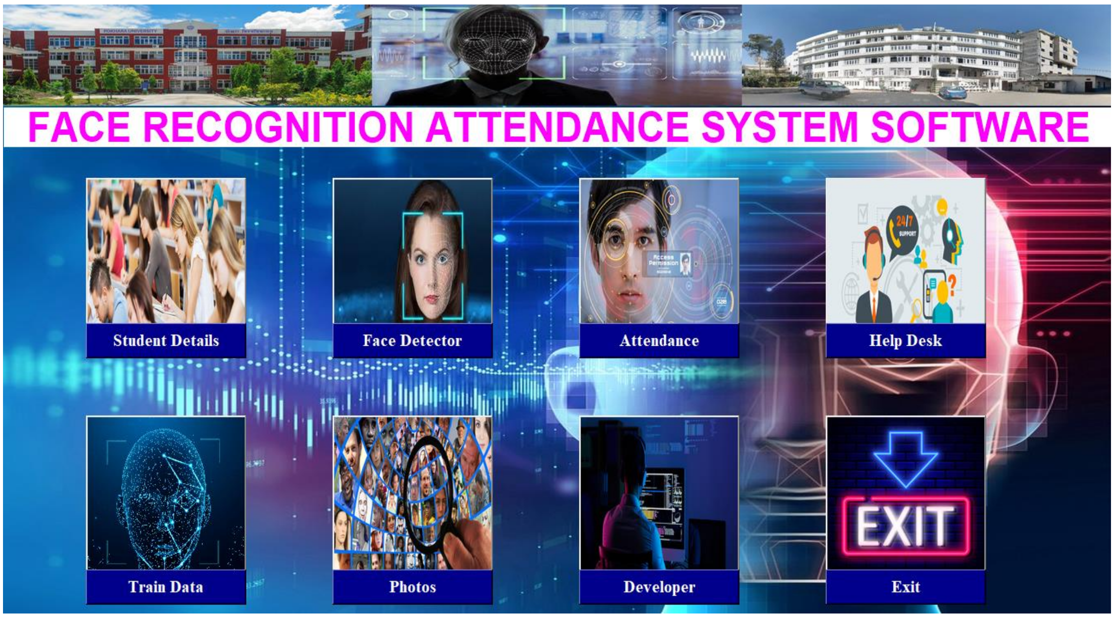
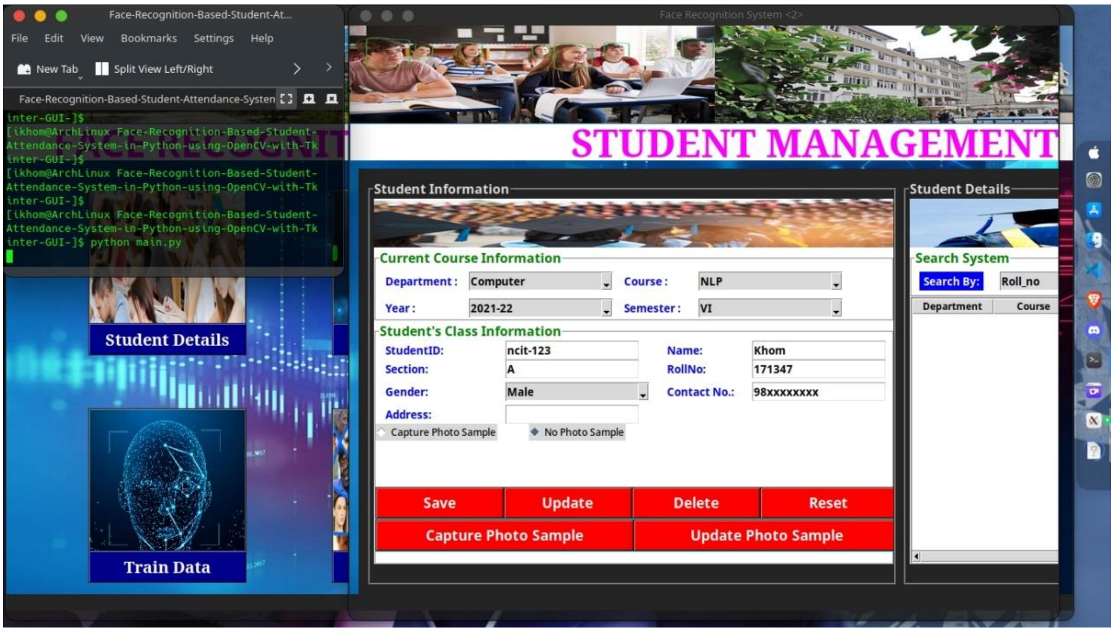


Figure 12: Face Recognition Attendance System Software Interface



```
inter-GUI-]$
[ikhom@ArchLinux Face-Recognition-Based-Student-
Attendance-System-in-Python-using-OpenCV-with-Tk
inter-GUI-]$
[ikhom@ArchLinux Face-Recognition-Based-Student-
Attendance-System-in-Python-using-OpenCV-with-Tk
inter-GUI-]$
[ikhom@ArchLinux Face-Recognition-Based-Student-
Attendance-System-in-Python-using-OpenCV-with-Tk
inter-GUI-]$ python main.py
```

Student Information

Current Course Information

Department : Computer
Course : NLP
Year : 2021-22
Semester : VI

Student's Class Information

StudentID: ncit-123
Name: Khom
Section: A
RollNo: 171347
Gender: Male
Contact No.: 98xxxxxxxx
Address:

○ Capture Photo Sample ● No Photo Sample

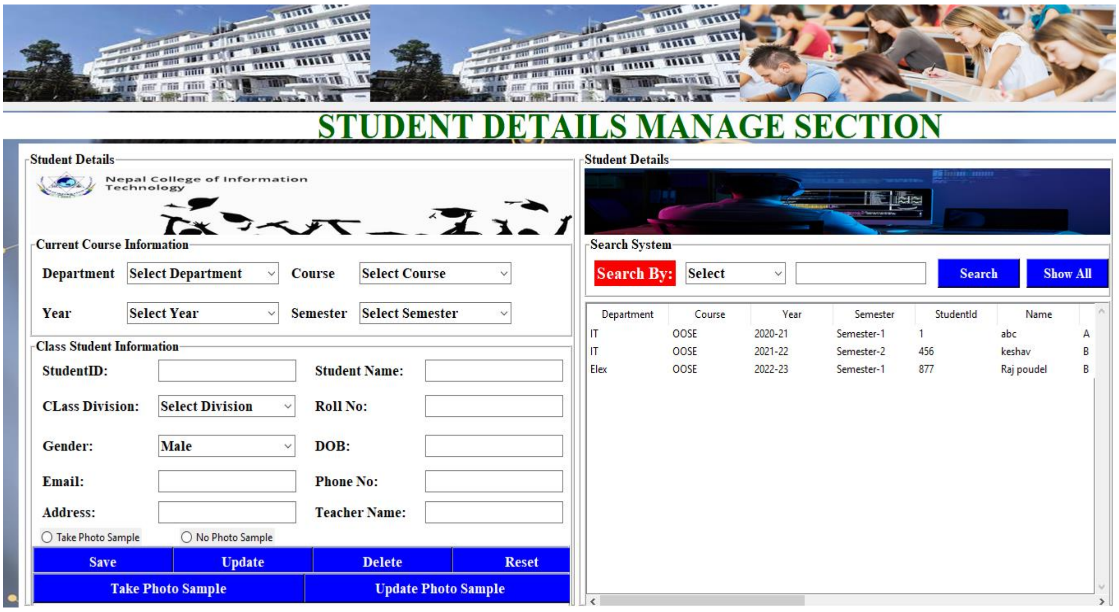
Student Details

Search System

Search By: Roll_no

Department	Course

Figure 13: Student Management System Interface



Current Course Information

Department: Select Department
Course: Select Course
Year: Select Year
Semester: Select Semester

Class Student Information

StudentID:
Student Name:
CLass Division: Select Division
Roll No:
Gender: Male
DOB:
Email:
Phone No:
Address:
Teacher Name:

Search By: Select

Department	Course	Year	Semester	StudentId	Name	
IT	OOSE	2020-21	Semester-1	1	abc	A
IT	OOSE	2021-22	Semester-2	456	keshav	B
Elex	OOSE	2022-23	Semester-1	877	Raj poudel	B

Figure 14: Student Details Manage Section

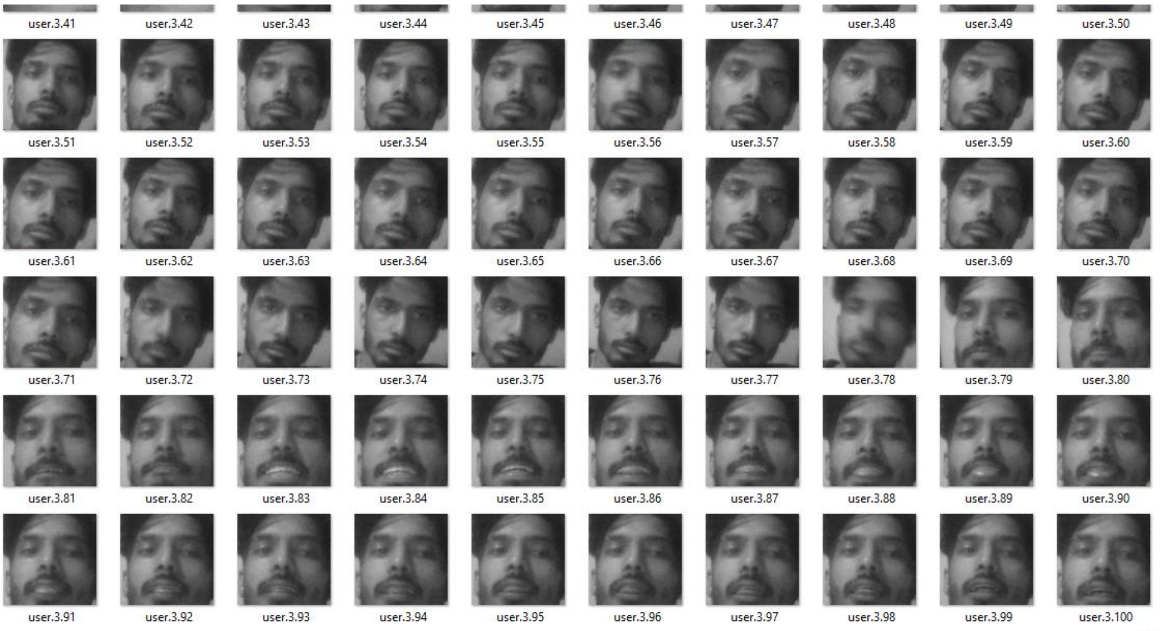


Figure 15: Capturing Photo Samples of Student “user”

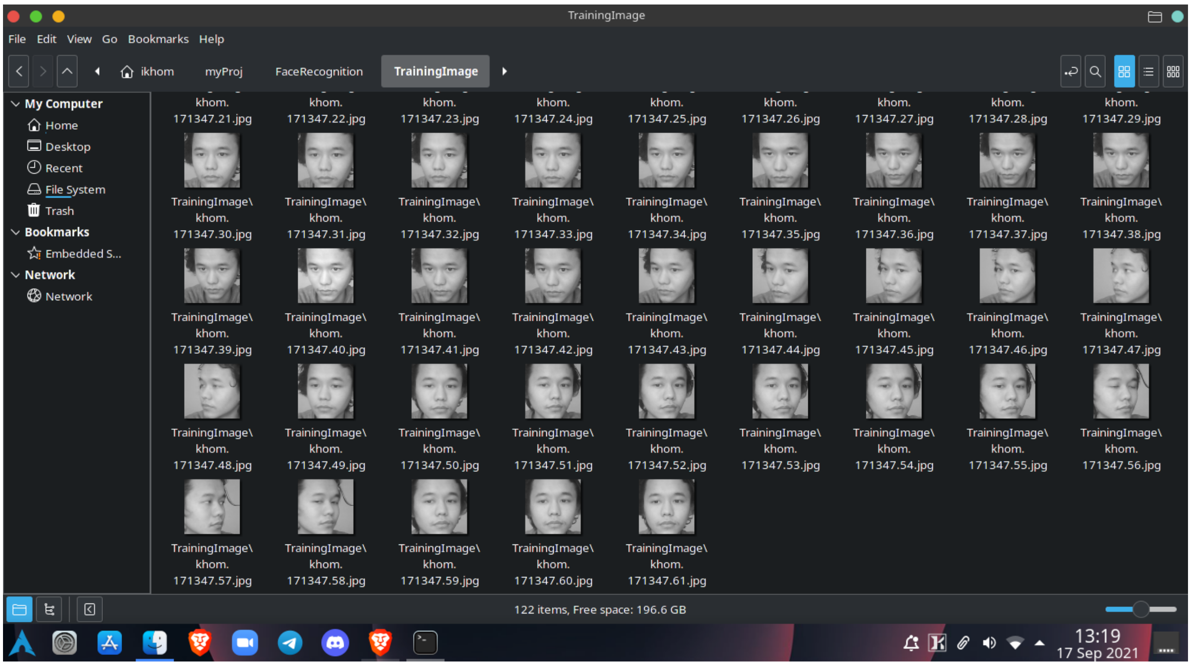

TrainingImage
File Edit View Go Bookmarks Help
ikhom
myProj
FaceRecognition
TrainingImage
My Computer
Home
Desktop
Recent
File System
Trash
Bookmarks
Embedded S...
Network
Network
khom. 171347.21.jpg
khom. 171347.22.jpg
khom. 171347.23.jpg
khom. 171347.24.jpg
khom. 171347.25.jpg
khom. 171347.26.jpg
khom. 171347.27.jpg
khom. 171347.28.jpg
khom. 171347.29.jpg
TrainingImage\ khom. 171347.30.jpg
TrainingImage\ khom. 171347.31.jpg
TrainingImage\ khom. 171347.32.jpg
TrainingImage\ khom. 171347.33.jpg
TrainingImage\ khom. 171347.34.jpg
TrainingImage\ khom. 171347.35.jpg
TrainingImage\ khom. 171347.36.jpg
TrainingImage\ khom. 171347.37.jpg
TrainingImage\ khom. 171347.38.jpg
TrainingImage\ khom. 171347.39.jpg
TrainingImage\ khom. 171347.40.jpg
TrainingImage\ khom. 171347.41.jpg
TrainingImage\ khom. 171347.42.jpg
TrainingImage\ khom. 171347.43.jpg
TrainingImage\ khom. 171347.44.jpg
TrainingImage\ khom. 171347.45.jpg
TrainingImage\ khom. 171347.46.jpg
TrainingImage\ khom. 171347.47.jpg
TrainingImage\ khom. 171347.48.jpg
TrainingImage\ khom. 171347.49.jpg
TrainingImage\ khom. 171347.50.jpg
TrainingImage\ khom. 171347.51.jpg
TrainingImage\ khom. 171347.52.jpg
TrainingImage\ khom. 171347.53.jpg
TrainingImage\ khom. 171347.54.jpg
TrainingImage\ khom. 171347.55.jpg
TrainingImage\ khom. 171347.56.jpg
TrainingImage\ khom. 171347.57.jpg
TrainingImage\ khom. 171347.58.jpg
TrainingImage\ khom. 171347.59.jpg
TrainingImage\ khom. 171347.60.jpg
TrainingImage\ khom. 171347.61.jpg
122 items, Free space: 196.6 GB
13:19
17 Sep 2021

Figure 16: Capturing Photo Samples of Student “khom.171347”

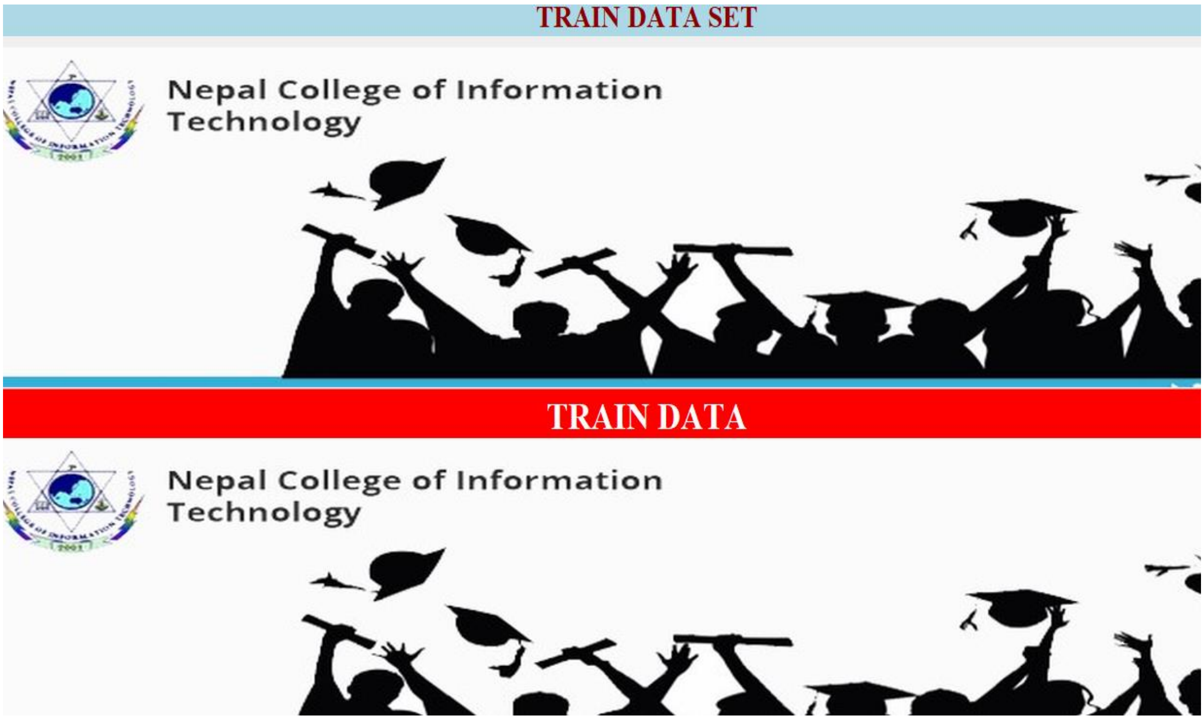

TRAIN DATA SET
Nepal College of Information Technology
TRAIN DATA
Nepal College of Information Technology

Figure 17: Train Data Set Interface

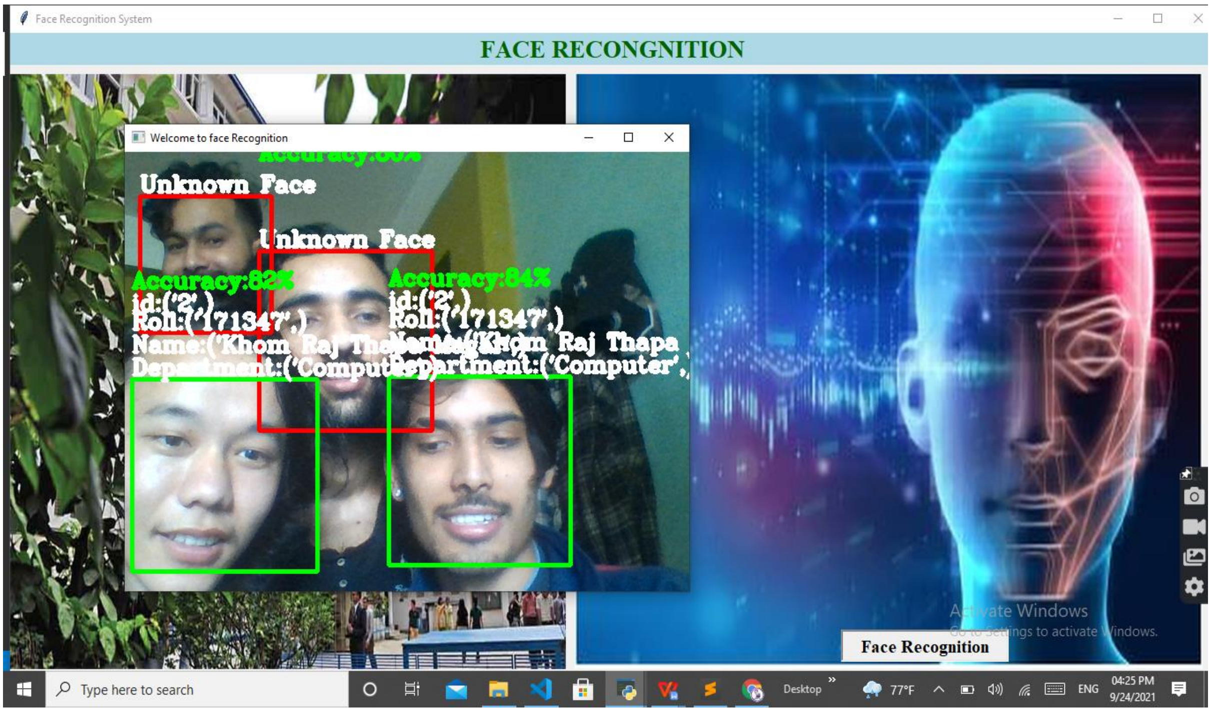


Figure 18: Face Detection with accuracy

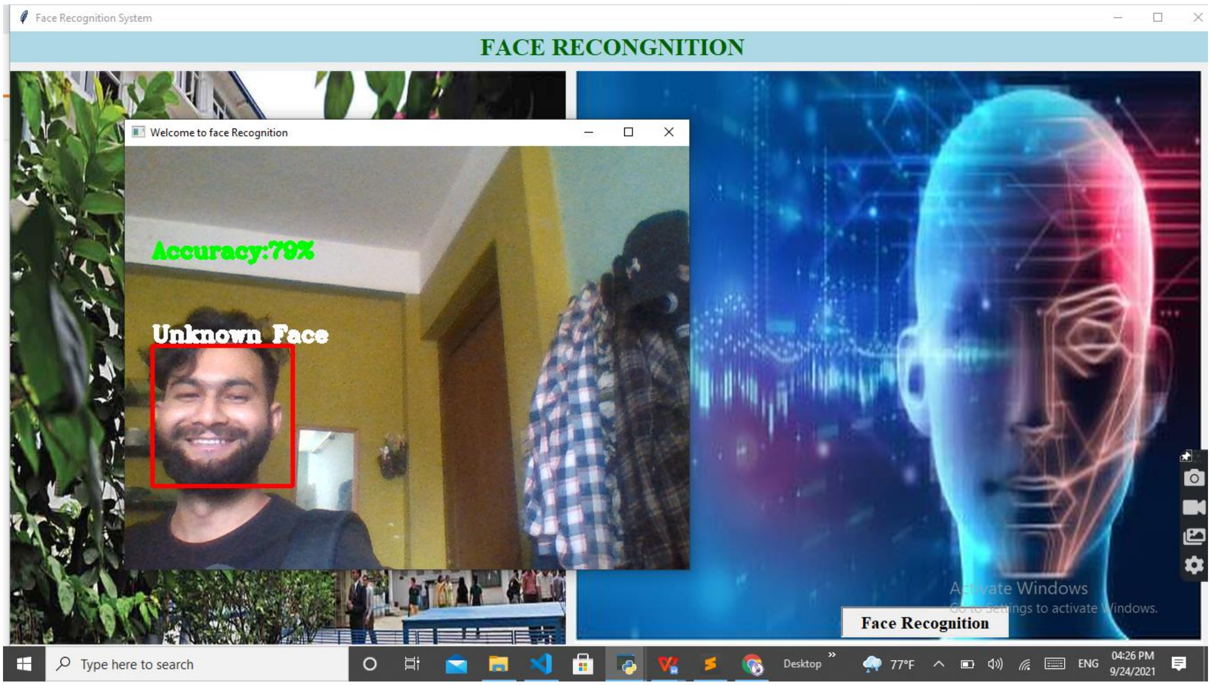
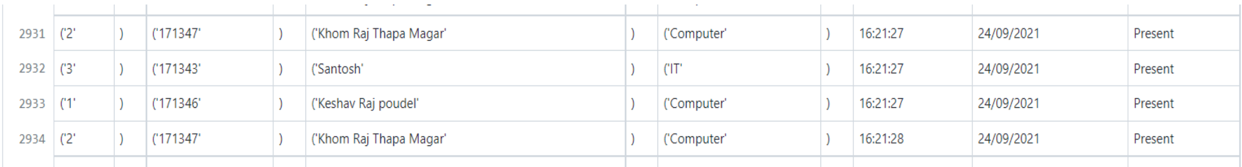


Figure 19: Unknown Face with less accuracy (i.e. <77%)



2931	('2'	)	('171347'	)	('Khom Raj Thapa Magar'	)	('Computer'	)	16:21:27	24/09/2021	Present
2932	('3'	)	('171343'	)	('Santosh'	)	('IT'	)	16:21:27	24/09/2021	Present
2933	('1'	)	('171346'	)	('Keshav Raj poudel'	)	('Computer'	)	16:21:27	24/09/2021	Present
2934	('2'	)	('171347'	)	('Khom Raj Thapa Magar'	)	('Computer'	)	16:21:28	24/09/2021	Present

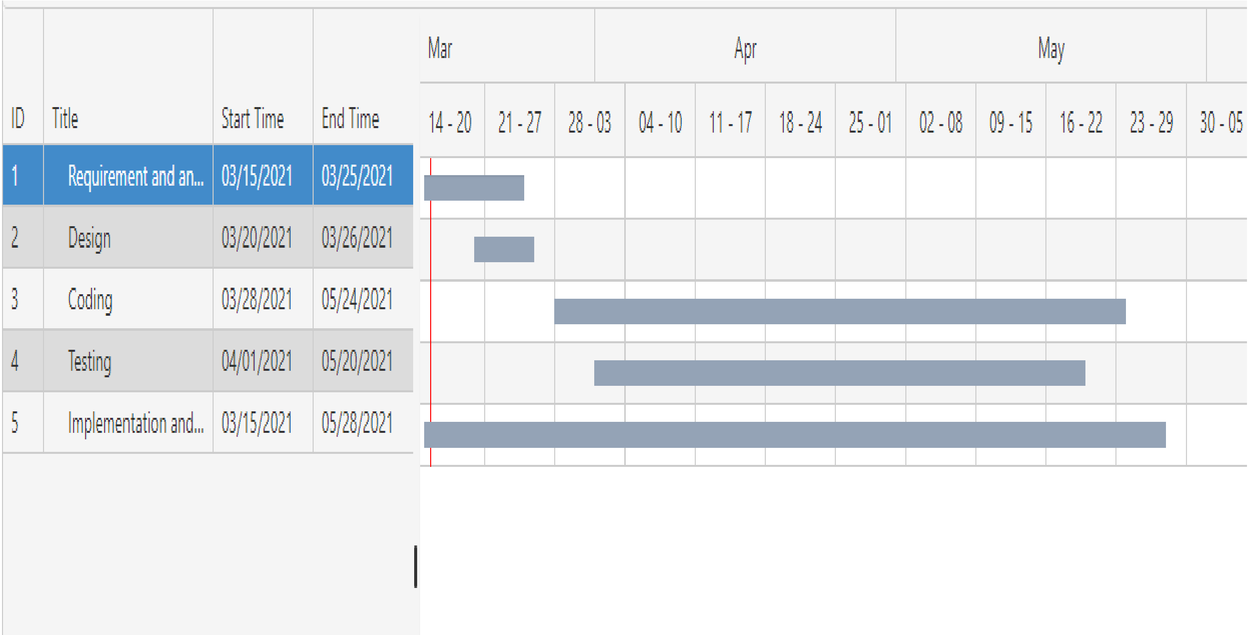
Figure 20: Generation of CSV File

5.1.1 Budget Analysis

S. N	PARTICULARS	QUANTITY
1.	Hourly cost per programmer	Rs 500
2.	No. of hours per day	3 hours
3.	No. of working day per weeks	4 days
4.	Project Period	3 months
5.	No. of programmer	3
6.	Total programmer cost	Rs 30,000
7.	Total project cost	Rs 40,000

Table 5.1.1: Budget Analysis

5.1.2 Work Schedule



ID	Title	Start Time	End Time
1	Requirement and an...	03/15/2021	03/25/2021
2	Design	03/20/2021	03/26/2021
3	Coding	03/28/2021	05/24/2021
4	Testing	04/01/2021	05/20/2021
5	Implementation and...	03/15/2021	05/28/2021

Figure 21: Gantt chart

5.2 Conclusion

Nowadays, various attendance and monitoring tools are used in practice in different places regardless of the fact that these solutions are mostly automatic, they are still prone to errors.

In this Face Recognition based student attendance system, we have used OpenCV, a Python open-source library, which is used for computer vision in Artificial intelligence, Machine Learning, face recognition, etc. that provides HAAR-Cascade Detection and LBPH algorithm for face recognition. By using the technology to conquer defects cannot merely save resources but also reduces human intervention in the whole process by handling all the complicated task to storage. It is determined that with the required number of face images along with the proposed method of augmentation high accuracy can be determined.

To wrap up, the system not only resolves troubles that exist in the traditional model of attendance but also provides convenience to the user to access the information collected by creating the CSV file.

6 LIMITATIONS AND FUTURE SCOPE

We, the team “kyzen”, identified some limitations which opens the door to opportunity for improvement and further enhancement in this project.

6.1 Limitations

1. The major limitation of the face recognition model is the recognition of a person’s 2D image. This leads to the attendance of being marked if the picture of a student is shown. Some face recognizers are made to detect the depth of faces and hence cannot be incorporated in this project.
2. Another constraint is that in this project 100 images of each student are taken for better accuracy. 100 images per student in a larger university/college would consume a massive volume to store the images.
3. Sometimes there may occur illumination and pose problems. And also the system can’t detect face with masks.
4. The training time for our classifier takes about 20 seconds for each person. Hence for a large number of students, it would be time consuming to train. Though training the classifier isn’t something that needs to be frequently done, but it would be better if a classifier taking lesser time while maintaining the accuracy can be built.
5. Small image sizes make facial recognition more difficult.
6. The current face recognition model is 96.78%.

6.2 Future Scope and Recommendation

1. A feature which can give intruder alert can be included in the system. Furthermore, the images of unknown people can be saved in an efficient manner and displayed in the system for better security.
2. Automatic mail alert/response to the parents regarding the presence and absence of the students can be added.
3. The number of training images can be reduced by removing duplicate images of the same person, or images with similar embeddings.
4. The training time can be reduced by retraining the classifier only for the newly added images.
5. Wrongly classified images can be added to the training dataset with the correct label so as to increase the accuracy of the recognition model.

7 REFERENCES

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[2] “Fingerprint Based Attendance System Using Microcontroller and LabView” (Kumar Yadav, Singh, Pujari, Mishra, 2015)

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system Filed: Dec. 27, 1971 Appl. No.: 212,281.

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https://www.cc.gatech.edu/~kihwan23/imageCV/Final2005/FinalProject_KH.htm

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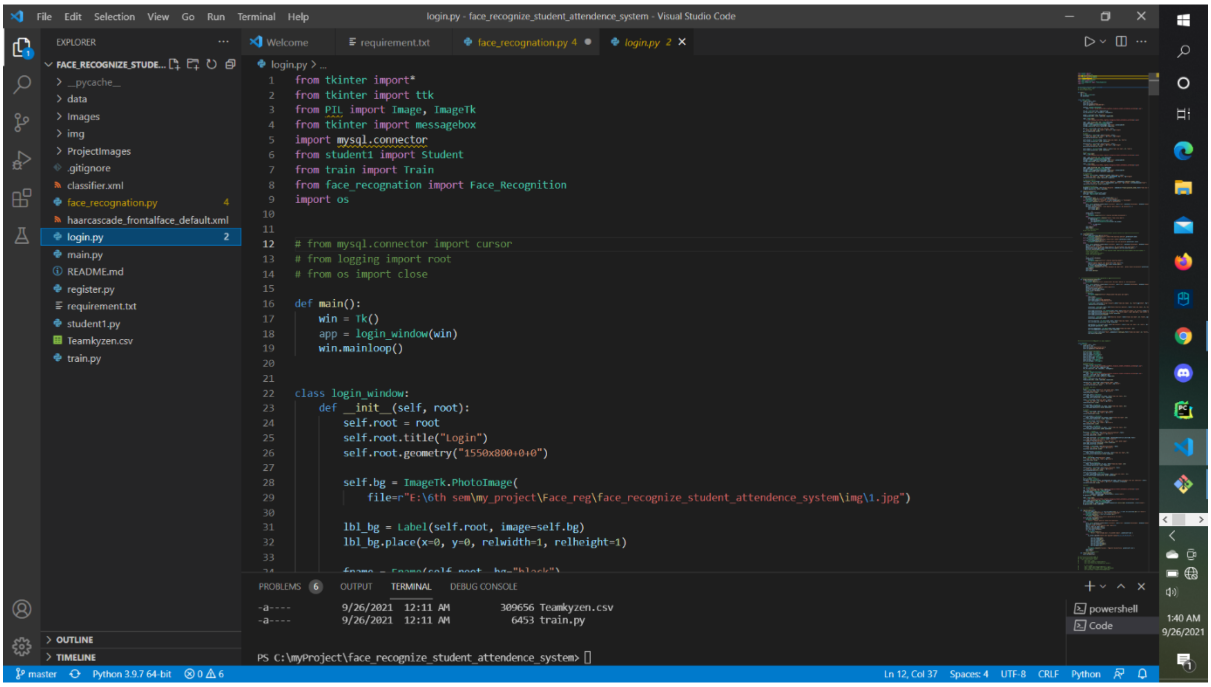
[10] Bifari, E.N.; Elrefaei, L.A.“Automated Fingerprint Identification System Based on Weighted Feature Points Matching Algorithm”, 978-1-4799-3080-7114/$31.00 ©2014 IEEE

[11] Agrawal, S., Khatri, P.: Facial expression detection techniques: based on Viola and Jones algorithm and principal component analysis. In: 2015 Fifth International Conference on Advanced Computing & Communication Technologies, pp. 108–112. IEEE (2015)

[12] Rowley, H.A., Baluja, S., Kanade, T. Neural Network-based Face Detection. IEEE Trans. Pattern Anal. Machine Intell., Vol. 20, No.1 Rowley

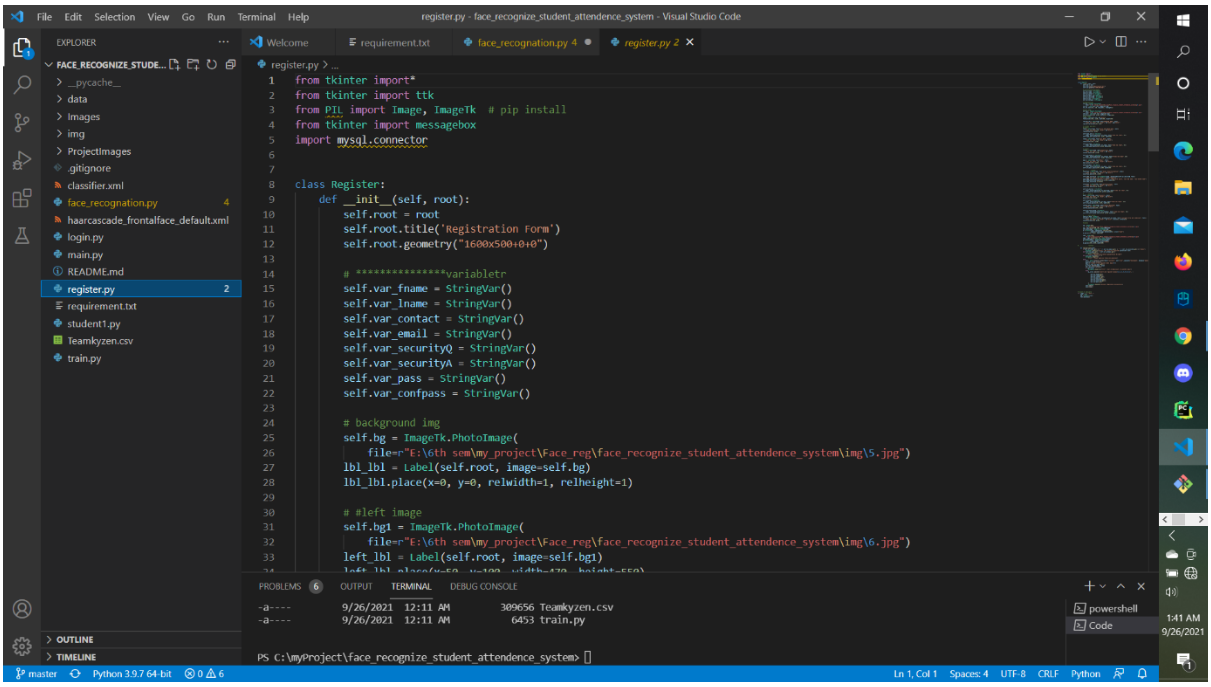
8 APPENDICES

Source Code Snapshots:



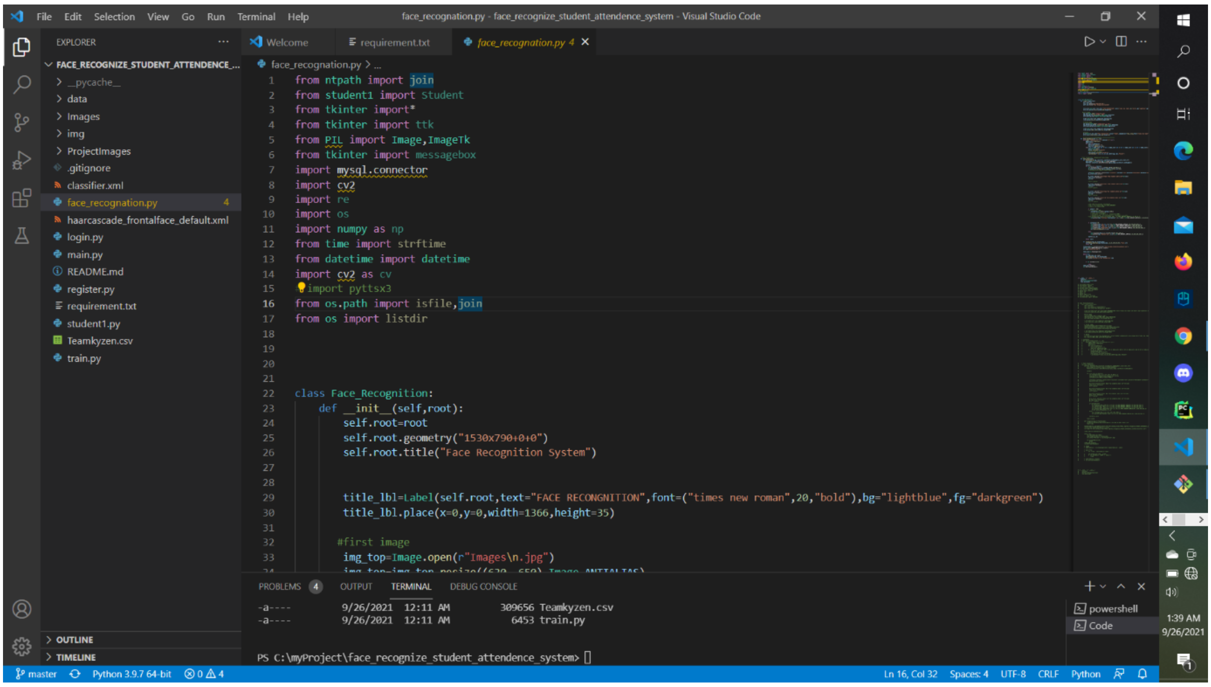
```python
from tkinter import*
from tkinter import ttk
from PIL import Image, ImageTk
from tkinter import messagebox
import mysql.connector
from student1 import Student
from train import Train
from face_recognation import Face_Recognition
import os


# from mysql.connector import cursor
# from logging import root
# from os import close

def main():
    win = Tk()
    app = login_window(win)
    win.mainloop()


class login_window:
    def __init__(self, root):
        self.root = root
        self.root.title("Login")
        self.root.geometry("1550x800+0+0")

        self.bg = ImageTk.PhotoImage(
            file=r"E:\6th sem\my_project\Face_reg\face_recognize_student_attendence_system\img\1.jpg")

        lbl_bg = Label(self.root, image=self.bg)
        lbl_bg.place(x=0, y=0, relwidth=1, relheight=1)

        frame = Frame(self.root, bg="black")
```

```
-a----         9/26/2021  12:11 AM         309656 Teamkyzen.csv
-a----         9/26/2021  12:11 AM           6453 train.py

PS C:\myProject\face_recognize_student_attendence_system> 
```



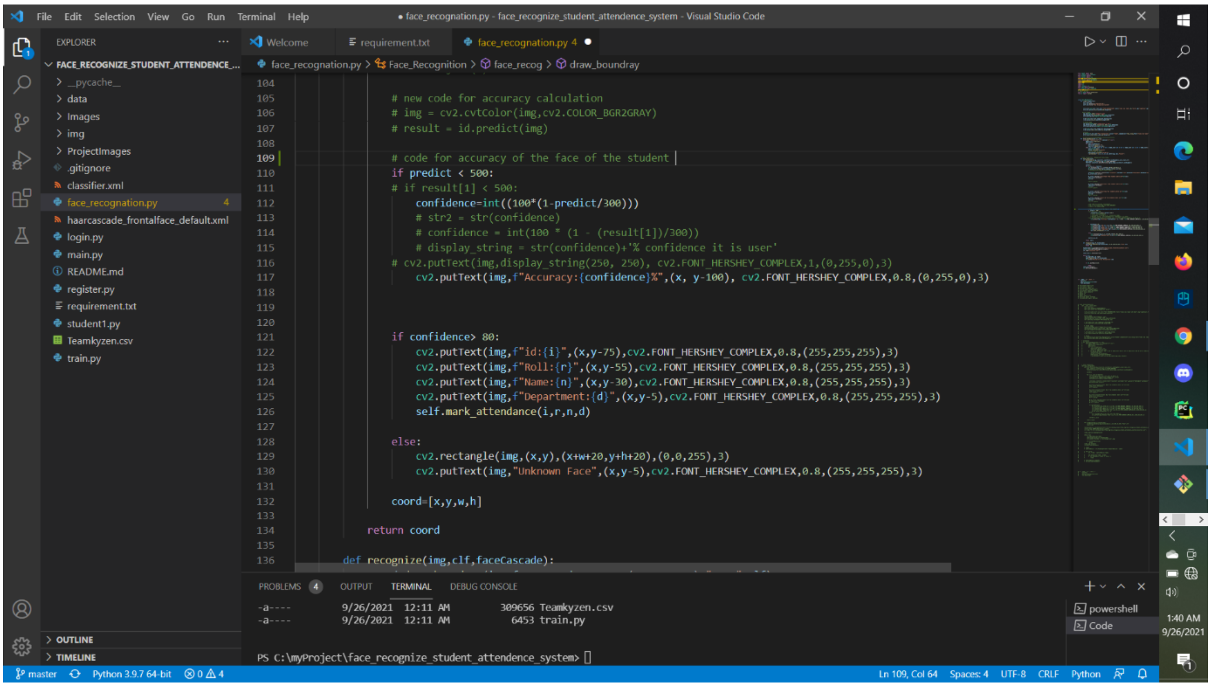
```python
from tkinter import*
from tkinter import ttk
from PIL import Image, ImageTk  # pip install
from tkinter import messagebox
import mysql.connector


class Register:
    def __init__(self, root):
        self.root = root
        self.root.title('Registration Form')
        self.root.geometry("1600x500+0+0")

        # **************variabletr
        self.var_fname = StringVar()
        self.var_lname = StringVar()
        self.var_contact = StringVar()
        self.var_email = StringVar()
        self.var_securityQ = StringVar()
        self.var_securityA = StringVar()
        self.var_pass = StringVar()
        self.var_confpass = StringVar()

        # background img
        self.bg = ImageTk.PhotoImage(
            file=r"E:\6th sem\my_project\Face_reg\face_recognize_student_attendence_system\img\5.jpg")
        lbl_lbl = Label(self.root, image=self.bg)
        lbl_lbl.place(x=0, y=0, relwidth=1, relheight=1)

        # #left image
        self.bg1 = ImageTk.PhotoImage(
            file=r"E:\6th sem\my_project\Face_reg\face_recognize_student_attendence_system\img\6.jpg")
        left_lbl = Label(self.root, image=self.bg1)
        left_lbl.place(x=50, y=100, width=470, height=550)
```

```
-a----         9/26/2021  12:11 AM         309656 Teamkyzen.csv
-a----         9/26/2021  12:11 AM           6453 train.py

PS C:\myProject\face_recognize_student_attendence_system> 
```



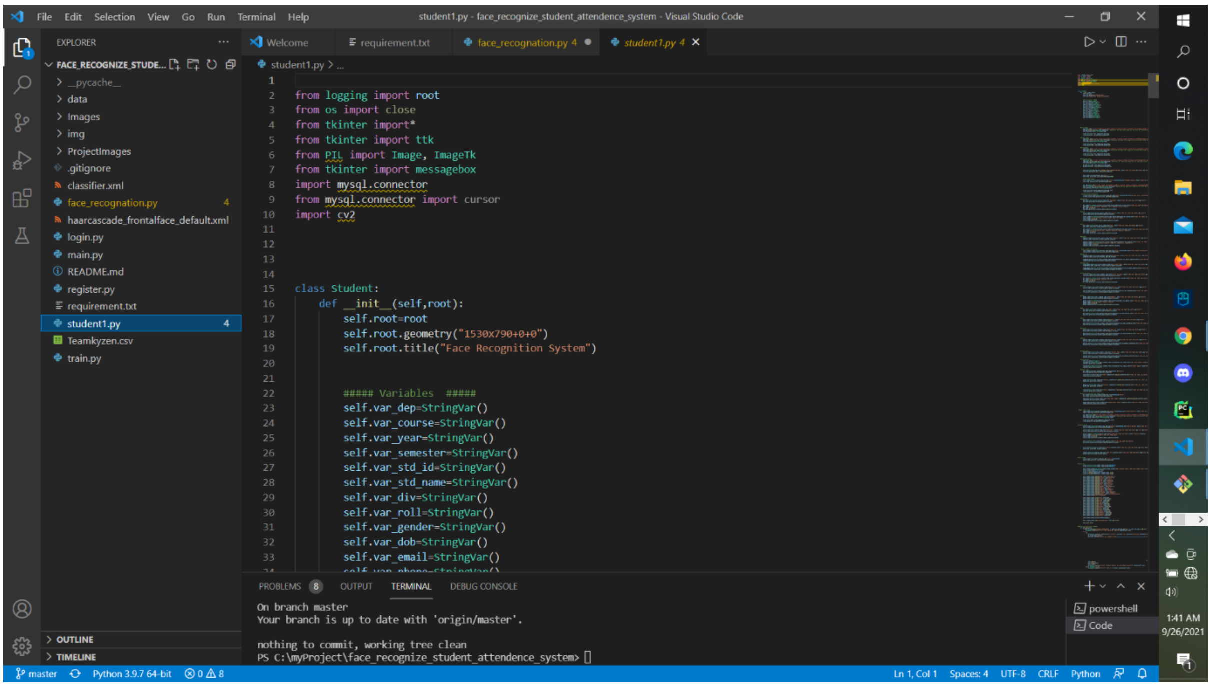
```
from ntpath import join
from student1 import Student
from tkinter import*
from tkinter import ttk
from PIL import Image,ImageTk
from tkinter import messagebox
import mysql.connector
import cv2
import re
import os
import numpy as np
from time import strftime
from datetime import datetime
import cv2 as cv
#import pyttsx3
from os.path import isfile,join
from os import listdir




class Face_Recognition:
    def __init__(self,root):
        self.root=root
        self.root.geometry("1530x790+0+0")
        self.root.title("Face Recognition System")


        title_lbl=Label(self.root,text="FACE RECONGNITION",font=("times new roman",20,"bold"),bg="lightblue",fg="darkgreen")
        title_lbl.place(x=0,y=0,width=1366,height=35)

       #first image
        img_top=Image.open(r"Images\n.jpg")
        img_top=img_top.resize((630, 650),Image.ANTIALIAS)
```

```
-a----         9/26/2021  12:11 AM         309656 Teamkyzen.csv
-a----         9/26/2021  12:11 AM           6453 train.py

PS C:\myProject\face_recognize_student_attendence_system> 
```



```

                # new code for accuracy calculation
                # img = cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)
                # result = id.predict(img)

                # code for accuracy of the face of the student 
                if predict < 500:
                # if result[1] < 500:
                    confidence=int((100*(1-predict/300)))
                    # str2 = str(confidence)
                    # confidence = int(100 * (1 - (result[1])/300))
                    # display_string = str(confidence)+'% confidence it is user'
                # cv2.putText(img,display_string(250, 250), cv2.FONT_HERSHEY_COMPLEX,1,(0,255,0),3)
                    cv2.putText(img,f"Accuracy:{confidence}%",(x, y-100), cv2.FONT_HERSHEY_COMPLEX,0.8,(0,255,0),3)



                if confidence> 80:
                    cv2.putText(img,f"id:{i}",(x,y-75),cv2.FONT_HERSHEY_COMPLEX,0.8,(255,255,255),3)
                    cv2.putText(img,f"Roll:{r}",(x,y-55),cv2.FONT_HERSHEY_COMPLEX,0.8,(255,255,255),3)
                    cv2.putText(img,f"Name:{n}",(x,y-30),cv2.FONT_HERSHEY_COMPLEX,0.8,(255,255,255),3)
                    cv2.putText(img,f"Department:{d}",(x,y-5),cv2.FONT_HERSHEY_COMPLEX,0.8,(255,255,255),3)
                    self.mark_attendance(i,r,n,d)

                else:
                    cv2.rectangle(img,(x,y),(x+w+20,y+h+20),(0,0,255),3)
                    cv2.putText(img,"Unknown Face",(x,y-5),cv2.FONT_HERSHEY_COMPLEX,0.8,(255,255,255),3)

                coord=[x,y,w,h]

            return coord

        def recognize(img,clf,faceCascade):
```

```
-a----         9/26/2021  12:11 AM         309656 Teamkyzen.csv
-a----         9/26/2021  12:11 AM           6453 train.py

PS C:\myProject\face_recognize_student_attendence_system> 
```



```python

from logging import root
from os import close
from tkinter import*
from tkinter import ttk
from PIL import Image, ImageTk
from tkinter import messagebox
import mysql.connector
from mysql.connector import cursor
import cv2




class Student:
    def __init__(self,root):
        self.root=root
        self.root.geometry("1530x790+0+0")
        self.root.title("Face Recognition System")


        ##### Variables  #####
        self.var_dep=StringVar()
        self.var_course=StringVar()
        self.var_year=StringVar()
        self.var_semester=StringVar()
        self.var_std_id=StringVar()
        self.var_std_name=StringVar()
        self.var_div=StringVar()
        self.var_roll=StringVar()
        self.var_gender=StringVar()
        self.var_dob=StringVar()
        self.var_email=StringVar()
        self.var_phone=StringVar()
```

```
On branch master
Your branch is up to date with 'origin/master'.

nothing to commit, working tree clean
PS C:\myProject\face_recognize_student_attendence_system> []
```