

FACIAL RECOGNITION ATTENDANCE SYSTEM USING PYTHON AND OPENCV

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering Degree in Electrical
and Electronics Engineering

by

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**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

Accredited with Grade "A" by NAAC

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **S.ASHWINI(39140004), LOGESHWARI.A(39140027), PAVITHRA.R(39140037), PAVITHRA.V(39140038)** who carried out the project entitled "**FACIAL RECOGNITION ATTENDANCE SYSTEM USING PYTHON AND OPENCV**" under my supervision from November 2021 to May 2022.

Dr. V. SIVACHIDAMBARANATHAN
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Submitted for Viva voce Examination held on _____ Name:

Signature:

Internal Examiner

External Examiner

DECLARATION

We Ashwini.S(39140004), Logeshwari.A(39140027), Pavithra.R(39140037) & Pavithra.V(39140038) hereby declare that the Project Report entitled “**FACIAL RECOGNITION ATTENDANCE SYSTEM USING PYTHON AND OPENCV**” done by us under the guidance of Dr.V.SIVACHIDAMBARANADHAN is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in Electrical and Electronics Engineering.



DATE:

PLACE:

SIGNATURE OF THE CANDIDATES

ACKNOWLEDGEMENT

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We wish to express our thanks to all Teaching and Non-teaching staff members of the Department of Electrical and Electronics Engineering who were helpful in many ways for the completion of the project.

ABSTRACT

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. Many problems arise when the authority is unable to enforce the regulation that exist in the old system. The technology working behind will be the face recognition system. The human face is one of the natural traits that can uniquely identify an individual. Therefore, it is used to trace identity as the possibilities for a face to deviate or being duplicated is low. In this project, face databases will be created to pump data into the recognizer algorithm. Then, during the attendance taking session, faces will be compared against the database to seek for identity. When an individual is identified, its attendance will be taken down automatically saving necessary information into a excel sheet. At the end of the day, the excel sheet containing attendance information regarding all individuals are mailed to the respective faculty.

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CHAPTER 1

INTRODUCTION:

Attendance being a very necessary side of administration may normally become an arduous, redundant activity, pushing itself to inaccuracies. The traditional approach of making roll calls proves itself to be a statute of limitations as it is very difficult to call names and maintain its record especially when the ratio of students is high. Every organization has its way of taking measures for the Attendance of students. Some organizations use document-oriented Approach and others have implemented these digital methods such as biometric fingerprinting techniques and card swapping techniques. however, these methods prove to be a statute of limitations as it subjects students to wait in a time-consuming queue. if the student fails to bring his id card then he will not be able to get attendance. evolving technologies have made many improvements in the changing world. The system of intelligent attendance is generally implemented with biometrics help. Recognition of face is one of the Biometric ways of improving this system. Face recognition proved to be a productive method for taking attendance.

CHAPTER 2

LITERATURE SURVEY

2.1 Automated Attendance System Using OpenCV

ABSTRACT:

Student Attendance mainframe structure is defined to manage the student's class attending files using the concept of face detection and recognition through open computer vision. The principle reason this system has been put forward is to improve the traditional attendance system of various universities to avoid the misuse of time and assets. The pointing-sides of automation world have forced an idea of switching from standard attendance to the digital system by using face detection and recognition methods. This is how the Student Attendance structure is being developed by introducing the dataset of an individual. The major reason of building this system is to improve the adaptability and performance of the attendance system procedure besides reducing the long term time load, work and disposables used. The main purpose of the Student Attendance markup structure is to perform, adding and manipulating attendance notes of an individual, automatic calculation on number of presentees and absentees based on subject and affability of the class and then generates the automated document or spreadsheet. This idea is completely based on general purpose language named as python through which we use the concept of open computer vision. For face detection system we used haarcascade and for face recognition, we used LBPH model; then the training of individual student happened and finally the system generates the spreadsheet which provides the no. of students present in classroom with an image or video capturing live.

2.2 Face Recognition Attendance System Based on Real-time Video Processing

ABSTRACT:

With the advent of the era of big data in the world and the commercial value of face recognition technology, the prospects for face recognition technology are very bright and have great market demand. This article aims to design a face recognition attendance system based on real-time video processing. This article mainly sets four directions to consider the problems: the accuracy rate of the face recognition system in the actual check-in, the stability of the face recognition attendance system with real-time video processing, the truancy rate of the face recognition attendance system with real-time video processing and the interface settings of the face recognition attendance system using real-time video processing. By analyzing the situation of these problems, the concept of attendance system based on face recognition technology is proposed, and the research on face recognition attendance system based on real-time video processing is carried out. Experimental data shows that the accuracy rate of the video face recognition system is up to 82%. Compared with the traditional check-in method, the face recognition attendance system can be reduced by about 60%. The rate of skipping classes has greatly reduced the phenomenon of students leaving early and skipping classes. The face recognition time and attendance system with real-time video processing through the above experimental certification can quickly complete the tasks of students in the time and attendance check-in system, get rid of the complex naming phenomenon, greatly improve the efficiency of class, and play an important role in guiding the development of the time and attendance system.

2.3 Attendance System Based on Face Recognition System Using CNN-PCA Method and Real-time Camera

ABSTRACT:

One of the developments in computer vision is the research on human face recognition. One of the implementations of the human face recognition system is used as an attendance system. The attendance system uses faces as objects to be detected and recognized as a person's identity and then stored as a face database. The process of matching face image data captured by the camera with face images that have been stored in the face database will result in face identification of the object faces captured by the camera. The face recognition-based attendance system in this study uses a hybrid feature extraction method using CNN-PCA (Convolutional Neural Network Principal Component Analysis). This combination of methods is intended to produce a more accurate feature extraction method. The face recognition-based attendance system using this camera is very effective and efficient to further improve the accuracy of user data. This face recognition-based attendance system using this camera has very accurate data processing and high accuracy so that it can produce a system that is reliable and powerful to identify human faces in real-time.

CHAPTER 3

AIM:

- Our primary goal is to help the lecturers, improve and organize the process of track and manage student attendance and absenteeism. Additionally, we seek to:
- Provides a valuable attendance service for both teachers and students.
- Reduce manual process errors by provide automated and a reliable attendance system uses face recognition technology.
- Increase privacy and security which student cannot presenting himself or his friend while they are not.
- Produce monthly reports for lecturers.
- Flexibility, Lectures capability of editing attendance records.
- Calculate absenteeism percentage and send reminder messages to students.

SCOPE:

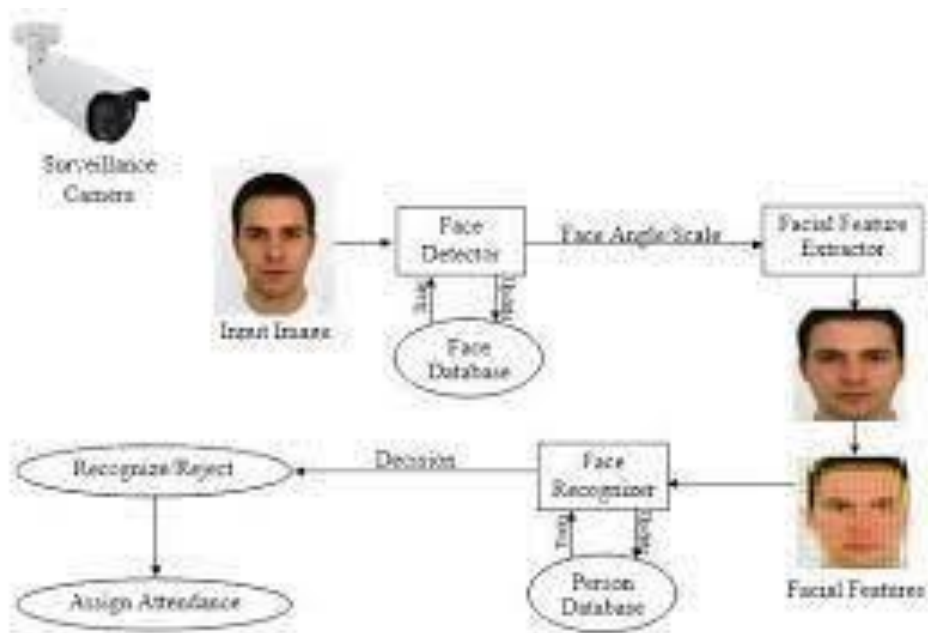
- Our project targets the students of different academic levels and faculty members. The main constraint we faced is distinguishing between identical twins. This situation is still a challenge to biometric systems especially facial recognition technology. According to Phillips and his co-researcher paper [2] to get the best results of the algorithms your system employed, they should run under certain conditions for taken pictures (i.e... age, gender, expressions, studio environmental etc.) otherwise, the problem is still ongoing.
- They provide application (method) to solve this problem, but in order to use this solution you have to sign a contract with the (NIST) organization and to be a researcher or developer. For us, to solve this issue we suggest to record twins' attendance manually.

EXISTING SYSTEM :

- We are using PCA and LDA algorithm used to recognition the face attendance system.
- But it is not accuracy to detect the faces. Also it will take some time to recognition the registered faces.
- So, we find out the mistake and improve the project in next level. There we have implemented a multiple face recognition system.

DISADVANTAGE:

- Materials like metal & liquid can impact signal.
- Sometimes not as accurate or reliable as barcode scanners.
- Cost – RFID readers can be 10x more expensive than barcode readers.
- Implementation can be difficult & time consuming.



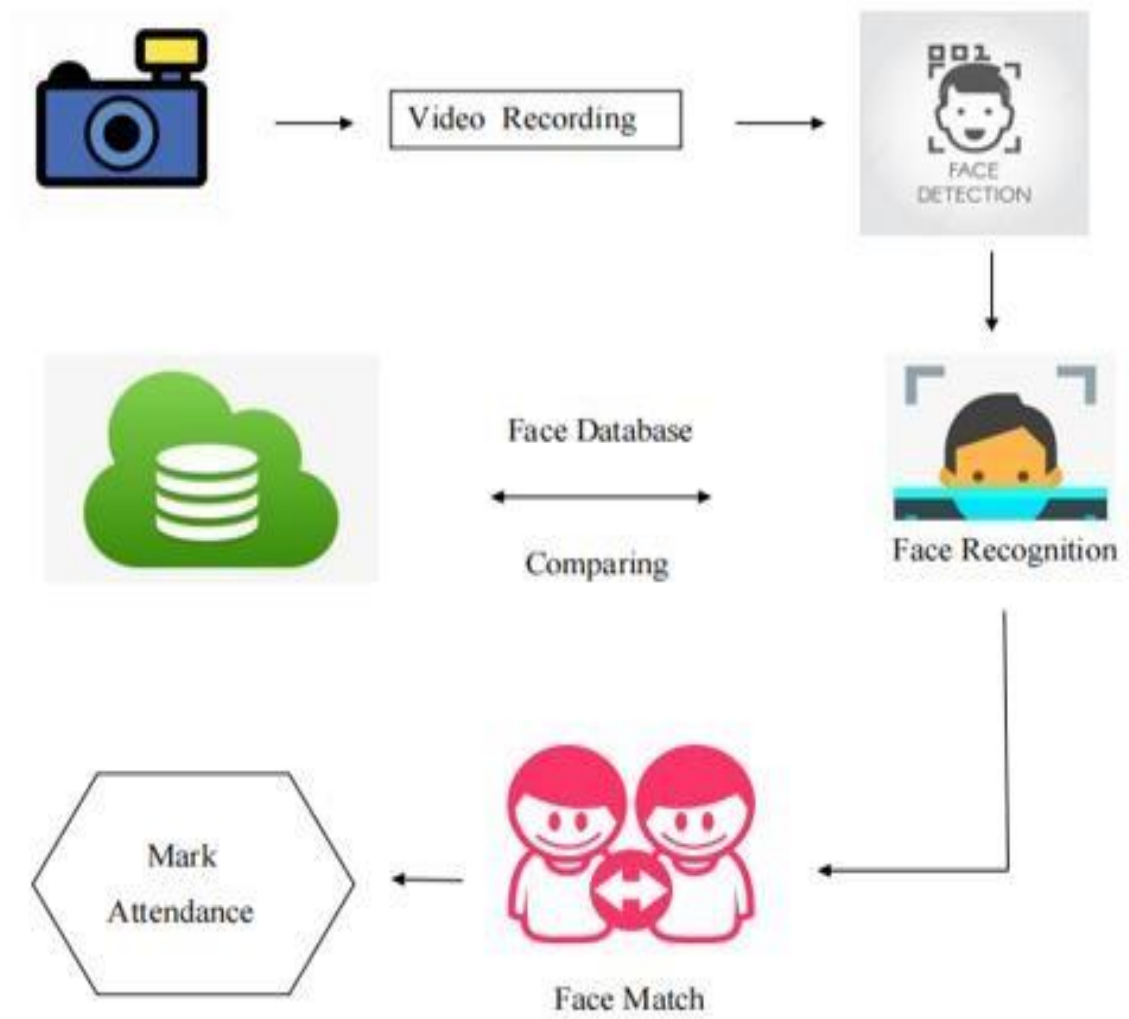
PROPOSED SYSTEM:

- We proposed the new methodologies for an automated attendance system using video-based face recognition.
- Here input to the system is a video and output is an excel sheet with attendance of the students in the video.
- Automated attendance system can be implemented using various techniques of biometrics.
- Face recognition is one of them which do not involve human intervention.
- In this paper, attendance is registered from a video of students of a class by first performing Face Detection which separates faces from non- faces, and then Face Recognition is carried out which finds the match of the detected face from the face database.
- If it is a valid match then attendance is registered to an excel sheet.

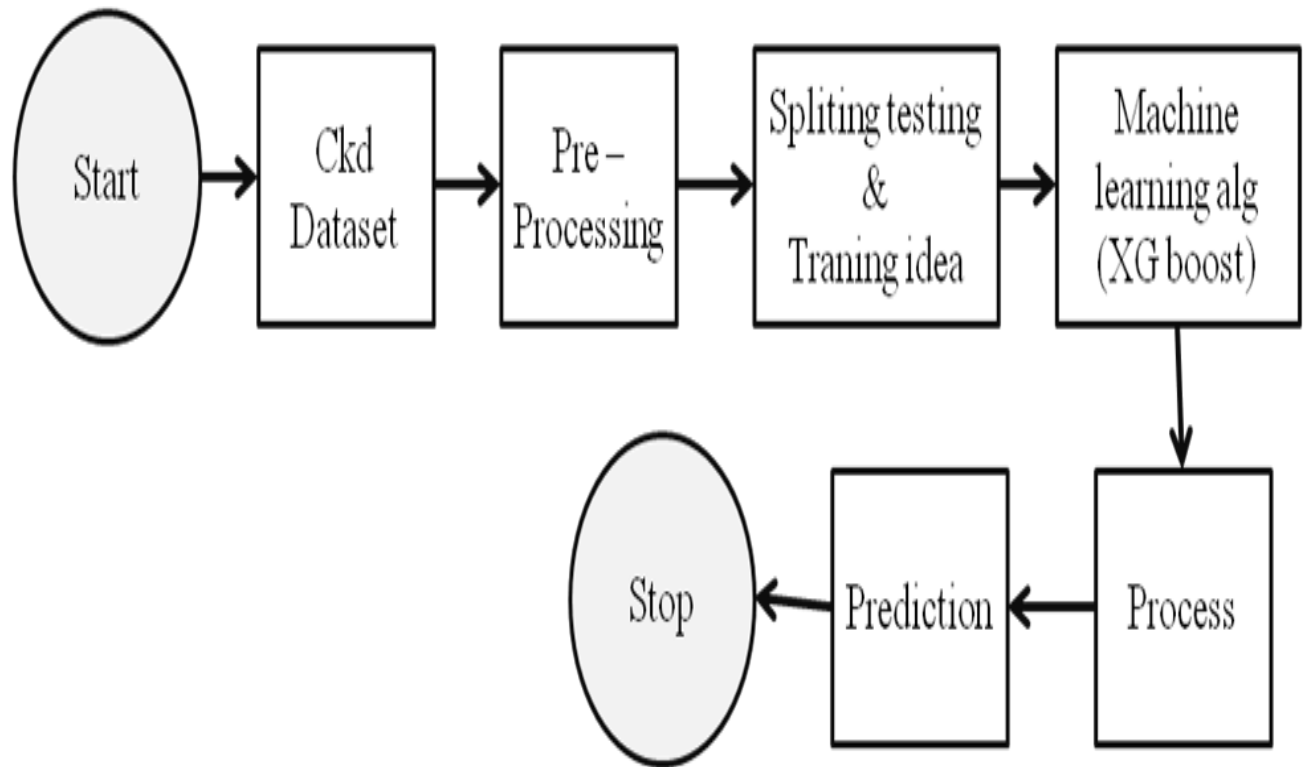
ADVANTAGE:

- The database of the attendance management system can hold up to 2000 individual's information.
- The facial recognition process can only be done for 1 person at a time.
- An excel sheet is created which contains the student attendance and is mailed to the respected faculty

BLOCK DIAGRAM:



FLOW DIAGRAM:



HARDWARE REQUIREMENTS:

- Operating System : Windows 7 , 8, 10 (64 bit)
- Software : Python 3.7
- Tools : Anaconda (Jupyter Note Book IDE)

SOFTWARE REQUIREMENTS:

- Hard Disk : 500GB and Above
- RAM : 4GB and Above
- Processor : I3 and Above



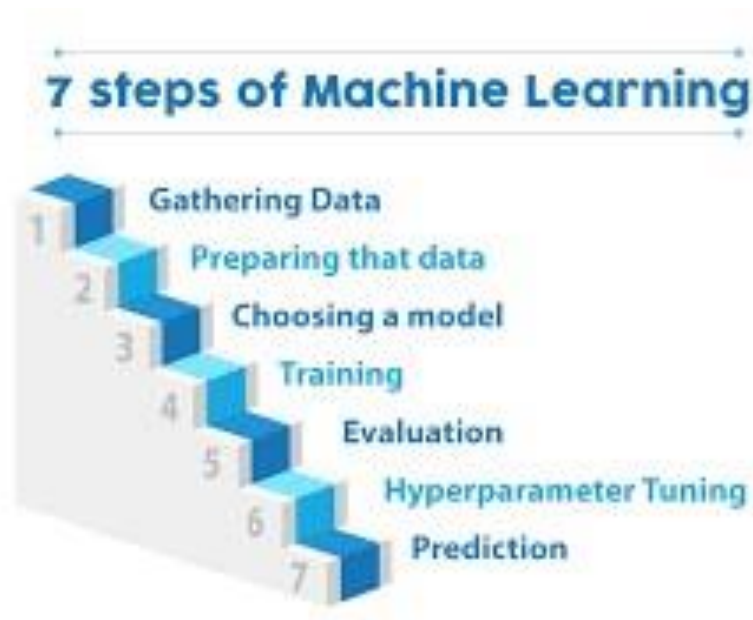
CHAPTER 4

MACHINE LEARNING:

What are the 7 steps of machine learning?

7 Steps of Machine Learning:

- Step 1: Gathering Data. ...
- Step 2: Preparing that Data. ...
- Step 3: Choosing a Model. ...
- Step 4: Training. ...
- Step 5: Evaluation. ...
- Step 6: Hyper parameter Tuning. ...
- Step 7: Prediction.



INTRODUCTION:

In this blog, we will discuss the workflow of a Machine learning project this includes all the steps required to build the proper machine learning project from scratch.

We will also go over data pre-processing, data cleaning, feature exploration and feature engineering and show the impact that it has on Machine Learning Model Performance. We will also cover a couple of the pre-modelling steps that can help to improve the model performance.

LIBRARIES:

- 1.Numpy
- 2.Pandas
- 3.Sci-kitLearn
4. Matplotlib

Understanding the machine learning workflow:

We can define the machine learning workflow in 3 stages.

1. Gathering data
2. Data pre-processing
3. Researching the model that will be best for the type of data
4. Training and testing the model
5. Evaluation

What is the machine learning Model?

The machine learning model is nothing but a piece of code; an engineer or data scientist makes it smart through training with data. So, if you give garbage to the model, you will get garbage in return, i.e. the trained model will provide false or wrong prediction.



1.GATHERING DATA:

The process of gathering data depends on the type of project we desire to make, if we want to make an ML project that uses real-time data, then we can build an IoT system that using different sensors data. The data set can be collected from various sources such as a file, database, sensor and many other such sources but the collected data cannot be used directly for performing the analysis process as there might be a lot of missing data, extremely large values, unorganized text data or noisy data. Therefore, to solve this problem Data Preparation is done.

We can also use some free data sets which are present on the internet. Kaggle and UCI Machine learning Repository are the repositories that are used the most for making Machine learning models. Kaggle is one of the most visited websites that is used for practicing machine learning algorithms, they also host competitions in which people can participate and get to test their knowledge of machine learning.

2. DATA PRE-PROCESSING:

Data pre-processing is one of the most important steps in machine learning. It is the most important step that helps in building machine learning models more accurately. In machine learning, there is an 80/20 rule. Every data scientist should spend 80% time for data pre-processing and 20% time to actually perform the analysis.

What is data pre-processing?

Data pre-processing is a process of cleaning the raw data i.e. the data is collected in the real world and is converted to a clean data set. In other words, whenever the data is gathered from different sources it is collected in a raw format and this data isn't feasible for the analysis.

Therefore, certain steps are executed to convert the data into a small clean data set, this part of the process is called as data pre-processing.

Why do we need it?

As we know that data pre-processing is a process of cleaning the raw data into clean data, so that can be used to train the model. So, we definitely need data pre-processing to achieve good results from the applied model in machine learning and deep learning projects. Most of the real-world data is messy, some of these types of data are:

1. **Missing data:** Missing data can be found when it is not continuously created or due to technical issues in the application (IOT system).
2. **Noisy data:** This type of data is also called outliers, this can occur due to human errors (human manually gathering the data) or some technical problem of the device at the time of collection of data.
3. **Inconsistent data:** This type of data might be collected due to human errors (mistakes with the name or values) or duplication of data.

Three Types of Data:

1. Numeric e.g. income, age
2. Categorical e.g. gender, nationality
3. Ordinal e.g. low/medium/high

How can data pre-processing be performed?

These are some of the basic pre — processing techniques that can be used to convert raw data.

1. **Conversion of data:** As we know that Machine Learning models can only handle numeric features, hence categorical and ordinal data must be somehow converted into numeric features.
2. **Ignoring the missing values:** Whenever we encounter missing data in the data set then we can remove the row or column of data depending on our need. This method is known to be efficient but it shouldn't be performed if there are a lot of missing values in the dataset.
3. **Filling the missing values:** Whenever we encounter missing data in the data set then we can fill the missing data manually, most commonly the mean, median or highest frequency value is used.
4. **Machine learning:** If we have some missing data then we can predict what data shall be present at the empty position by using the existing data.
5. **Outliers detection:** There are some error data that might be present in our data set that deviates drastically from other observations in a data set. [Example: human weight = 800 Kg; due to mistyping of extra 0]

CHAPTER 5

MODULE DESCRIPTION:

- Creating database
- Video recording
- Face Detection
- Face Recognition
- Registering the attendance

Creating Database:

- The database is the training set of our system and is created in such a way that it contains images of enrolled students.
- These images are cropped to get the region of interest which is the face of the student
- Labeled Faces in the Wild is a database of face photographs designed for studying the problem of unconstrained face recognition.
- The database contains images of faces collected from the web.

Video Recording:

- We must have a very good quality camera to get the efficient detection and recognition.
- It will capture the video.
- The video into convert the multiple frames. It will helpful for more accurate to produce the results.
- Facial recognition is a way of identifying or confirming an individual's identity using their face.

- Facial recognition systems can be used to identify people in photos, videos, or in real-time.
- Facial recognition is a category of biometric security.

Face Detection:

- We are train the collected video frames using Because, it will train to multiple times and push a very fast results.
- Face detection is a computer technology being used in a variety of applications that identifies human faces in digital images.
- Face detection also refers to the student attendance by which training the image data set to the marked

Creating Database:

- This is the most important module of our system which is used to perform the comparison between the test images and the training images.
- the use of face detection come first to determine and isolate face before it can be recognized
- Faces are made of thousands of fine lines and features that must be matched.

Face Recognition:

- Face recognition systems use computer algorithms to pick out specific, distinctive details about a person's face
- the use of face detection come first to determine and isolate face before it can be recognized
- Faces are made of thousands of fine lines and features that must be matched for face recognition
- The system works on face recognition where each student in the class is photographed and their details are stored in a server

Registering the Attendance:

- After completion of the face recognition module, next comes the module to register the attendance.
- If the detected face has been recognized, then it marks the attendance in the excel sheet.

Steps of Working:

- STEP 1: Create a DATASET of the student by entering his Enrollment &name .
- STEP 2: Take image & Train the dataset, automatic attendance for EXCEL sheet will be created.
- STEP 3: Attendance is taken by cropping the faces in the picture and comparing with the faces in the database.
- STEP 4: A picture of the class is taken, and the enter the your subject fill the attendance and checked for the sheet automatic provide a for EXCEL sheet
- STEP 5: If a face is matched, the responding name with PRESENT status is marked in a EXCEL file with the current date and time.

ALGORITHM USED:

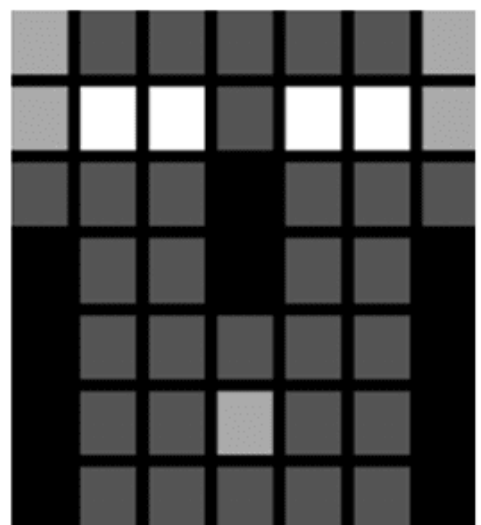
i)OPENCV:

OpenCV-Python is a library of Python bindings designed to solve computer vision problems. Python is a general purpose programming language started by Guido van Rossum that became very popular very quickly, mainly because of its simplicity and code readability.

OpenCV is the huge open-source library for the computer vision, machine learning, and image processing and now it plays a major role in real-time operation which is very important in today's systems. By using it, one can process images and videos to identify objects, faces, or even handwriting of a human

ii) Haar Cascade algorithm:

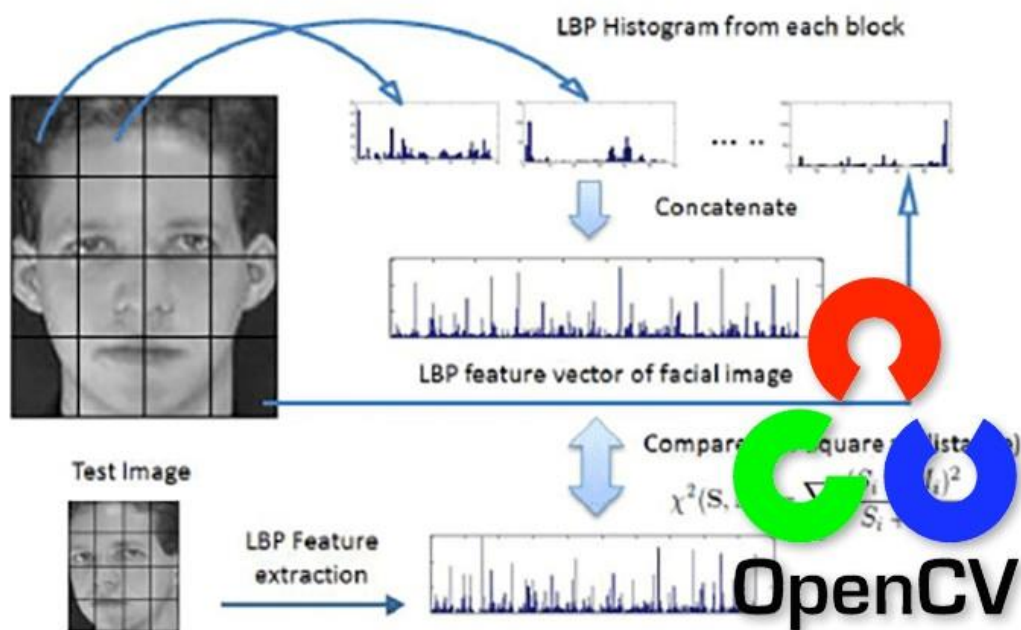
- It is an Object Detection Algorithm used to identify faces in an image or a real time video.
- The algorithm uses edge or line detection features proposed by Viola and Jones in their research paper —Rapid Object Detection using a Boosted Cascade
- The algorithm is given a lot of positive images consisting of faces, and a lot of negative images not consisting of any face to train on them.



Here, we can see the original face image divided into 7×7 cells (*left*). Then, on the *right*, we can see the weighting scheme for each of the cells:

Given a face in a dataset, the first step of the algorithm is to divide the face into 7×7 equally sized cells:

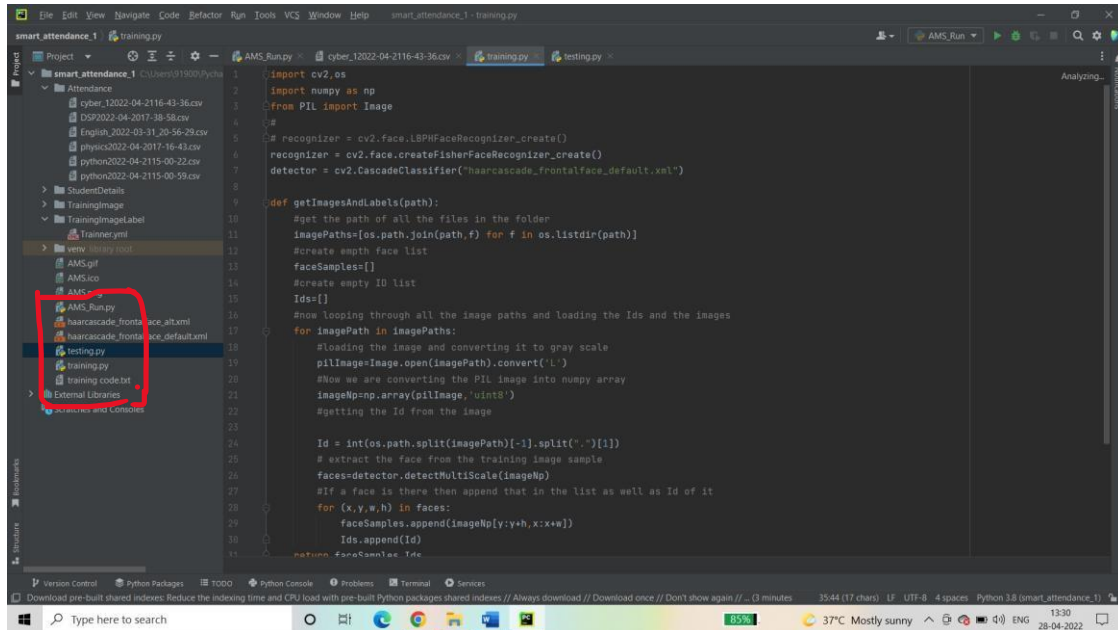
By definition, a histogram throws away all spatial information regarding how the patterns are oriented next to each other. **However, by computing a histogram for each of the cells, we actually are able to encode a level of spatial information such as the eyes, nose, mouth, etc., that we would otherwise not have.**



OUTPUT SIMULATION:

There are three main coding:

- Testing.py
- Training.py
- AMS_run.py



TESTING CODE: Helps to detect the face and store it in a database

TRAINING CODE: Trains the model so that next time face recognized will show details

MAIN CODE:(GUI) Graphics User Interface

```

Run.py x cyber_12022-04-2116-43-36.csv x training.py x testing.py x
#get the path of all the files in the folder
imagePaths=[os.path.join(path,f) for f in os.listdir(path)]
#create empty face list
faceSamples=[]
#create empty ID list
Ids=[]
#now looping through all the image paths and loading the Ids and the images
for imagePath in imagePaths:
    #loading the image and converting it to gray scale
    pilImage=Image.open(imagePath).convert('L')
    #Now we are converting the PIL image into numpy array
    imageNp=np.array(pilImage,'uint8')
    #getting the Id from the image

    Id = int(os.path.split(imagePath)[-1].split(".")[1])
    # extract the face from the training image sample
    faces=detector.detectMultiScale(imageNp)
    #If a face is there then append that in the list as well as Id of it
    for (x,y,w,h) in faces:
        faceSamples.append(imageNp[y:y+h,x:x+w])
        Ids.append(Id)
    return faceSamples,Ids

faces,Ids = getImagesAndLabels('TrainingImage')
recognizer.train(faces, np.array(Ids))
recognizer.save('TrainingImageLabel/trainer.yml')

```

```

Run Tools VCS Window Help smart_attendance_1 - testing.py
AMS_Run.py x cyber_12022-04-2116-43-36.csv x training.py x testing.py x
1 import cv2
2 import numpy as np
3 #recognizer = cv2.face.createLBPHFaceRecognizer()
4 recognizer = cv2.face.LBPHFaceRecognizer_create()
5 recognizer.read('TrainingImageLabel/trainer.yml')
6 cascadePath = "haarcascade_frontalface_default.xml"
7 faceCascade = cv2.CascadeClassifier(cascadePath)
8 font = cv2.FONT_HERSHEY_SIMPLEX
9
10 cam = cv2.VideoCapture(0)
11 while True:
12     ret, im =cam.read()
13     gray=cv2.cvtColor(im,cv2.COLOR_BGR2GRAY)
14     faces=faceCascade.detectMultiScale(gray, 1.2,5)
15     for(x,y,w,h) in faces:
16         Id, conf = recognizer.predict(gray[y:y+h,x:x+w])
17
18         # # else:
19         # #     Id="Unknown"
20         # cv2.rectangle(im, (x-22,y-90), (x+w+22, y-22), (0,255,0), -1)
21         cv2.rectangle(im, (x, y), (x + w, y + h), (0, 255, 0), 2)
22         cv2.putText(im, str(Id), (x,y-40),font, 2, (255,255,255), 3)
23
24         # cv2.putText(im, str(Id), (x + h, y), font, 1, (0, 255, 0), 2)
25     cv2.imshow('im',im)
26     if cv2.waitKey(10) & 0xFF==ord('q'):
27         break
28     cam.release()
29     cv2.destroyAllWindows()

```

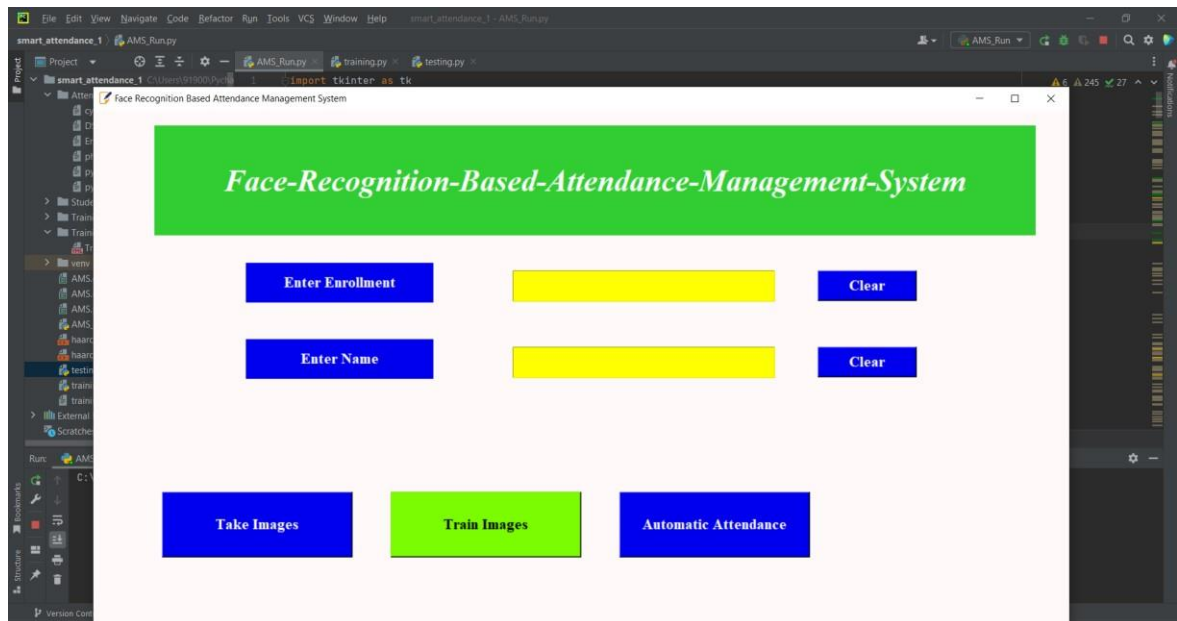
```

AMS_Run.py x cyber_12022-04-2116-43-36.csv x training.py x testing.py x
1 import tkinter as tk
2 from tkinter import *
3 import cv2
4 import csv
5 import os
6 import numpy as np
7 from PIL import Image
8 import pandas as pd
9 import datetime
10 import time
11
12 window = tk.Tk()
13 window.title("Face Recognition Based Attendance Management System")
14
15 window.geometry('1280x720')
16 window.configure(background='snow')
17
18
19 def manually_fill():
20     global sb
21     sb = tk.Tk()
22     sb.iconbitmap('AMS.ico')
23     sb.title("Enter subject name...")
24     sb.geometry('580x320')
25     sb.configure(background='snow')
26
27 def err_screen_for_subject():
28
29     def ec_delete():
30         ec.destroy()
31

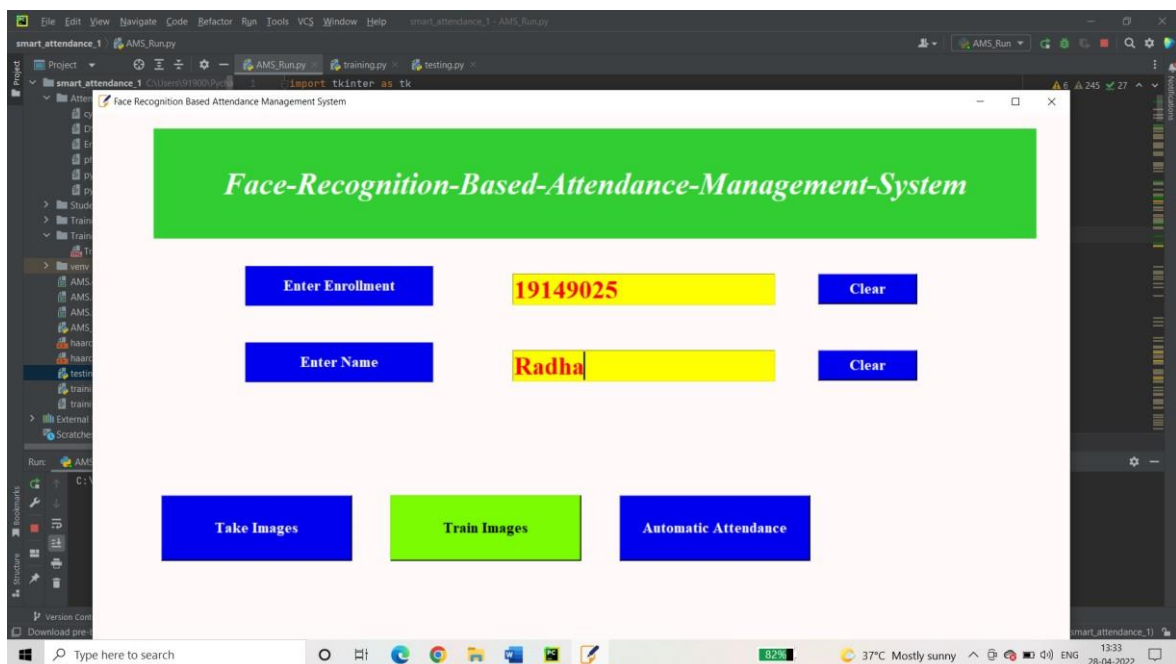
```

These are the inputs given to our project. These coding includes all the commands like Opening camera, storing detected image into database, training the model, storing all the information such as roll number and name and the subject name, converting it into excel sheets.

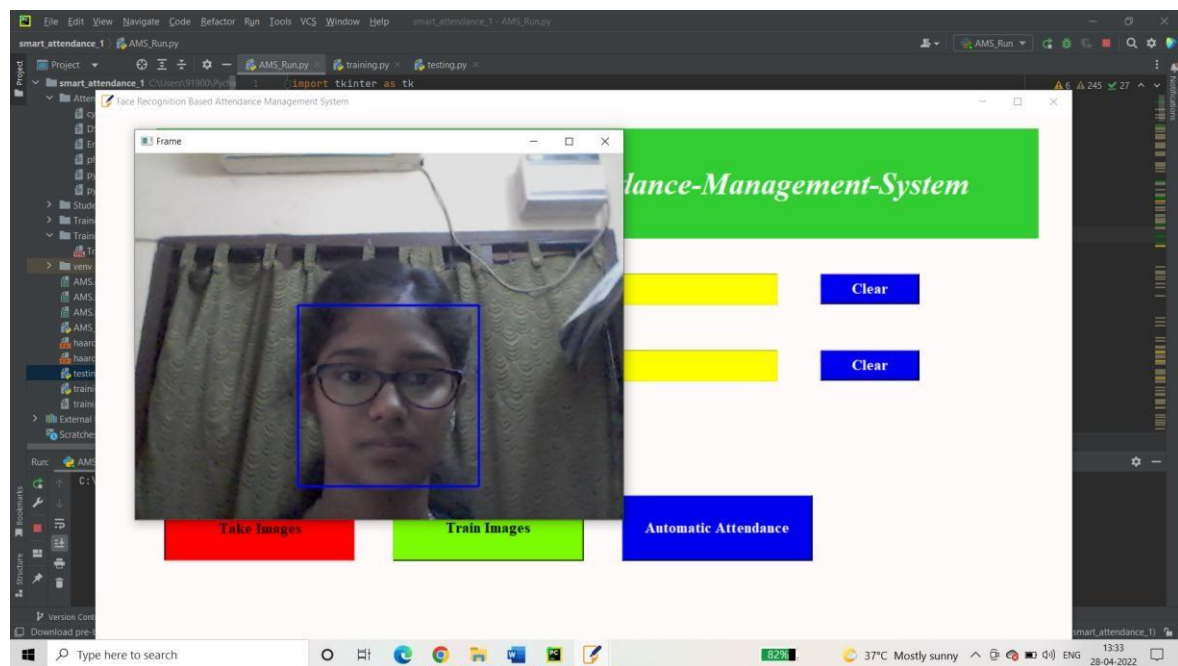
After running the Code, a pop-up window will appear,



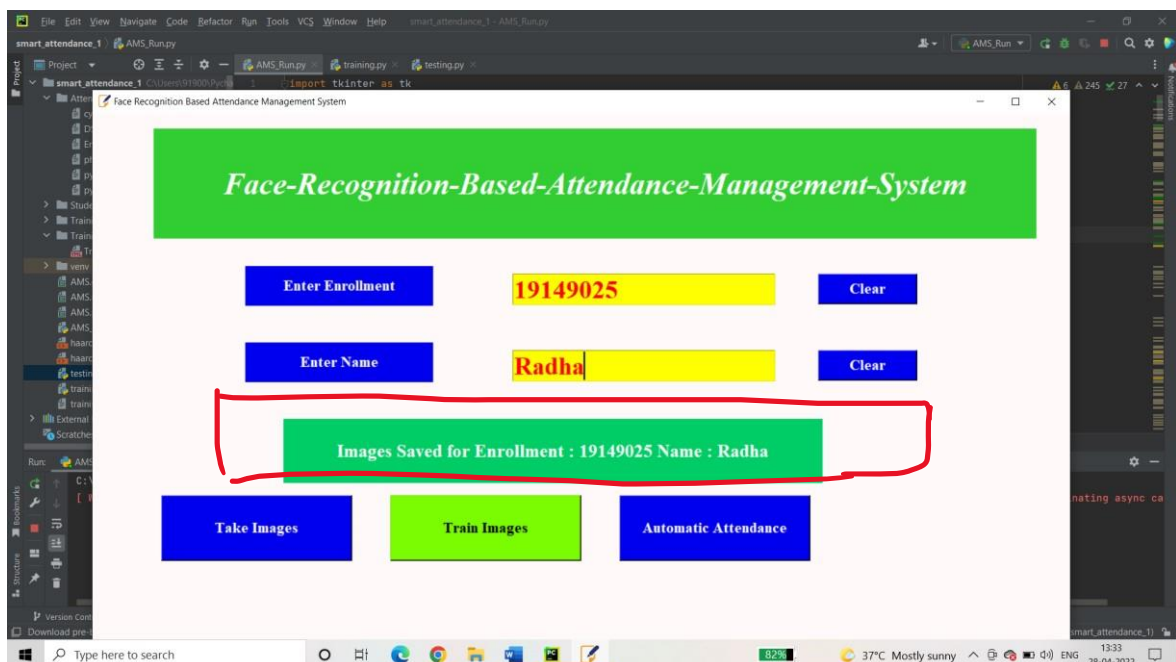
Enter the name and Roll number of the student in the box,



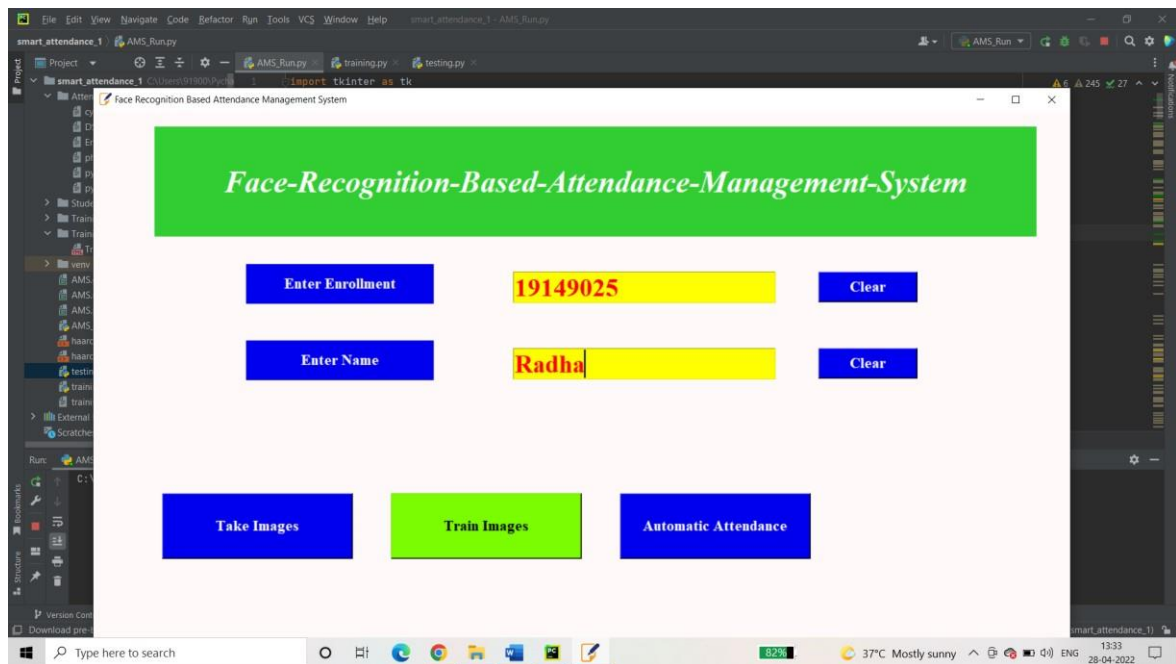
After clicking Take images, camera get opens and the face will be captured,



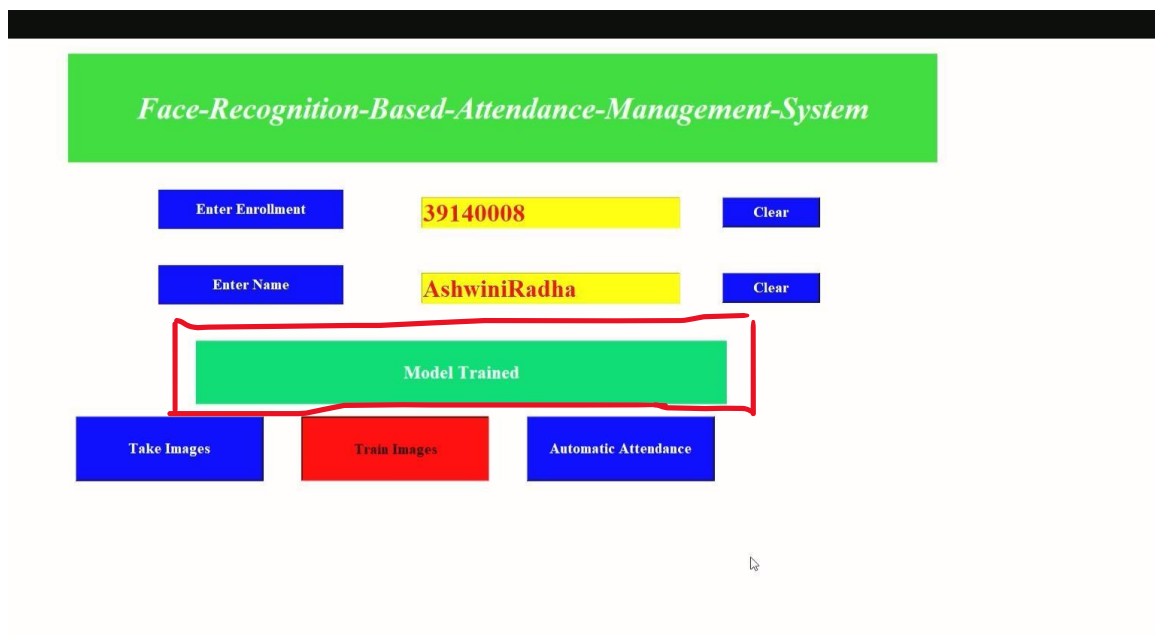
Captured Image will get saved to respective Name and enrollment and stored,



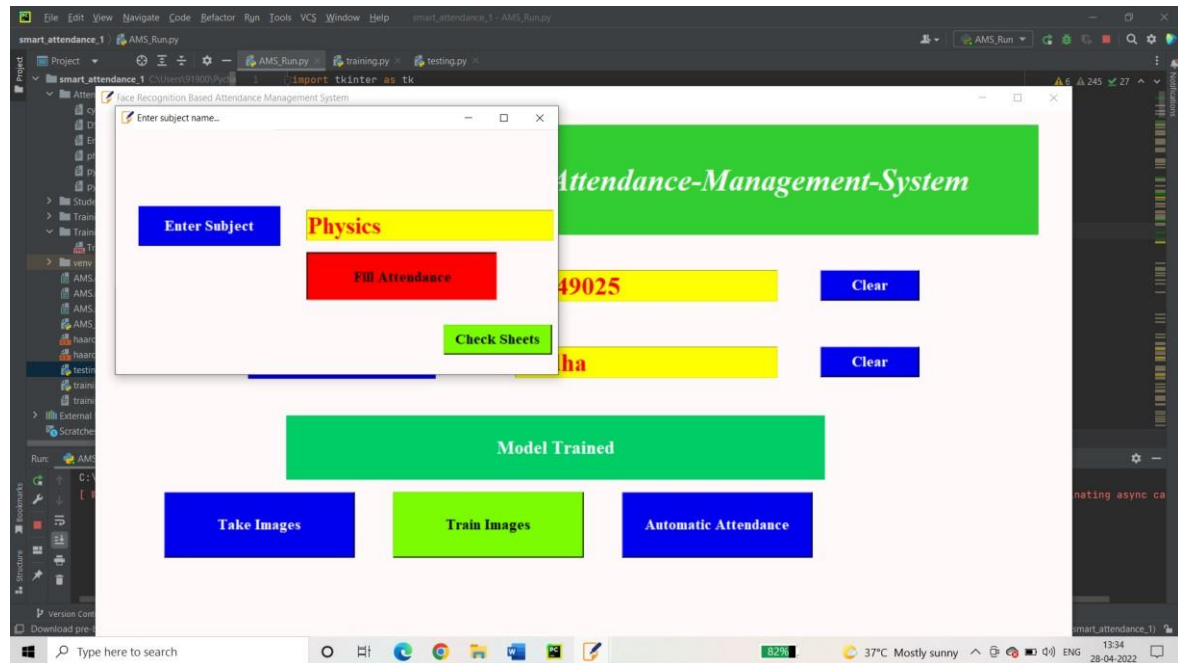
After taking images ,Click Train images, this will train the image and the details for future purpose.



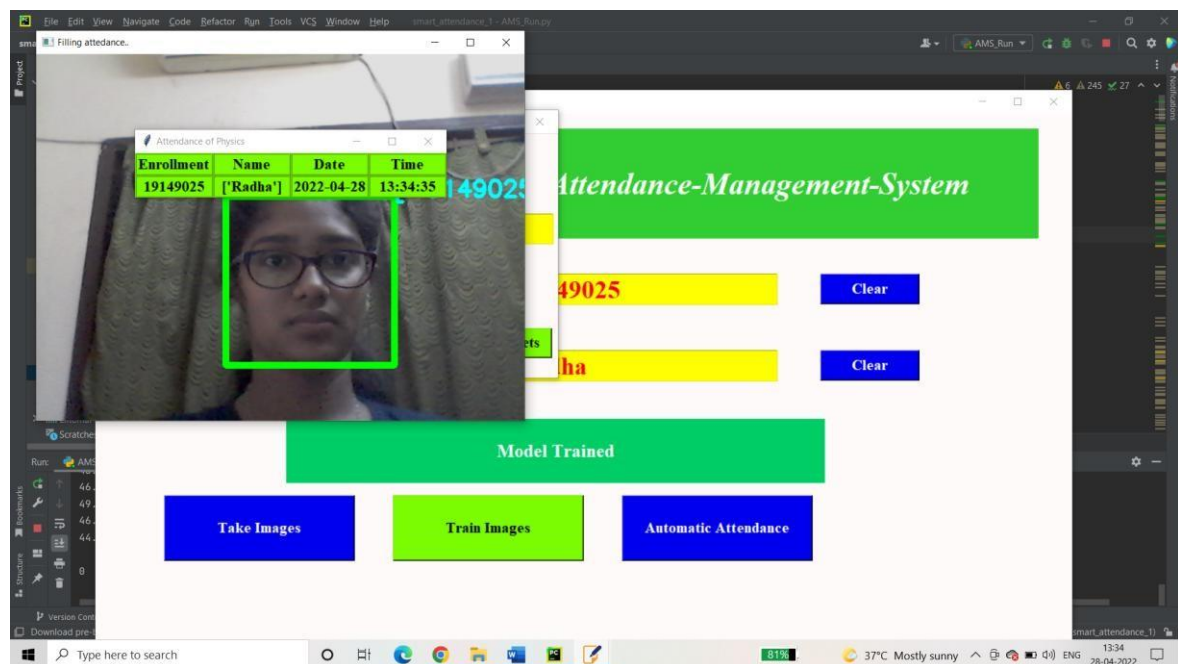
After the model gets trained, you will receive a notification and the face is recognized,



The attendance will be taken subject wise,



Now if a student takes attendance, once his/her face is detected, the face is recognized, and automatically excel sheet is created.



CHAPTER 6

CONCLUSION:

- Before the development of this project. There are many loopholes in the process of taking attendance using the old method which caused many troubles to most of the institutions.
- Therefore, the facial recognition feature embedded in the attendance monitoring system can not only ensure attendance to be taken accurately and also eliminated the flaws in the previous system.
- By using technology to conquer the defects cannot merely save resources but also reduces human intervention in the whole process by handling all the complicated task to the machine.
- The only cost to this solution is to have sufficient space in to store all the faces into the database storage. Fortunately, there is such existence of micro SD that can compensate with the volume of the data.
- In this project, the face database is successfully built. Apart from that, the face recognizing system is also working well.
- At the end, the system not only resolve troubles that exist in the old model but also provide convenience to the user to access the information collected by mailing the attendance sheet to the respected faculty

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