

AUTOMATED ATTENDENCE SYSTEM BASED ON FACIAL RECOGNITION

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This Report Presented in Partial Fulfillment of the Requirements for the
Degree of Bachelor of Science in Computer Science and Engineering.

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APPROVAL

This Project/internship titled “Automated Attendance System Based on Facial Recognition”, submitted by Fazle Rabbi, Tanvir Ahmed, Barira Yasmin ID No: 162-15-7799, 162-15-7720, 162-15-7886 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 09 July 2020.

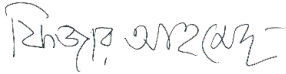
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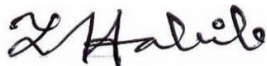
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DECLARATION

We hereby state that, this project has been done by us under the supervision of **Mr. Sheikh Abujar, Senior Lecturer**, and department of CSE Daffodil International University. We also state that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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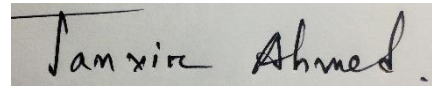
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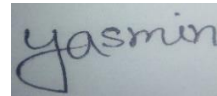
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ABSTRACT

“AUTOMATED ATTENDENCE SYSTEM BASED ON FACIAL RECOGNITION”, is a Machine Learning project. This project basically without human assistance system that helps take attendance by recognize trained students real time frontal face image. It's very easy to use and its GUI is very simple and user friendly anyone can simply use it. We used to build this project with the main library that is OpenCV and Tkinter. This system recognition works very well. This can be used is any educational institution and corporate offices. This system is not time consuming, it's a relive for who takes the attendance. We tried our level best to make this easy to use and effective.

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CHAPTER 1

INTRODUCTION

1.1 Motivation

As like we wished to require going to system clear by exploitation OpenCV library. OpenCV was intended for technique competency and with a vigorous focus on real time applications.

Along these lines, its useful for real time face recognition exploitation net camera. Track images then researcher's information can spare in an exceedingly outperform sheet. Face recognition is that the undertaking of recognize trained image.

1.2 Objective

The goal of machine learning is regularly – however not always – to train a model on chronicled, labelled data (data for which the outcome is known) so as to predict the value some amount based on the basis of a new data item for which the target classification is unknown. The objective of our projects are:

- Efficient.
- Automated System.
- Real Time Recognizer.
- Digitalize System.
- User Friendly.

1.3 Description

Our project is based on machine learning. Frontal Face-Recognition based attendance system that works with the detect real-time face and also recognize trained images. After that add this data into the dataset. Our system is built by using openCV and python GUI Tkinter. It's so easy to use and user friendly.

1.4 Expected Outcome

Our project is based on machine learning. It's just trained our machine then we'll get out expected result. Expected outcome of our projects are:

- We can automatically take attendance by using this system.
- It's has real-time image detection and recognition.
- This system can operate with web-cam.
- The GUI of this system is very simple and user friendly.
- The accuracy of this system is above 70%.

1.5 Report Layout

Chapter 1: Introduction

In this section we discussed about project motivation, objectives and expected outcome.

Chapter 2: Background Study

In this section we discussed about literature review, comparative studies and scope of the problem of our project.

Chapter 3: Requirement Specification

In this section we brief our requirements for the project. That's are machine learning python libraries.

Chapter 4: Design Specification

In this section we brief about front end and back end design of this project.

Chapter 5: Implementing and Testing

This section contains the implementing and test result of this project.

Chapter 6: Conclusion and Future Work

In this section we brief about this project conclusion and future scope of work.

CHAPTER 2

BACKGROUND STUDY

2.1 Introduction

Our project is a machine learning project; the system is automated attendance system based on OpenCv Face Recognition. The system works automatically and features real-time face detection and recognition for taking attendance. The GUI of this system is save time and more important its user friendly. Our project is based on machine learning python libraries. Before going to brief of this project, a literature review of openCv is required. This system is focused machine learning automated attendance system.

2.2 Literature Review

There are so many projects and thesis papers complete on face detection and object detection. There some of python libraries are mostly used in machine learning for detection's. SciPy, Keras TensorFlow, OpenCv etc those are mostly used for recognition and detection. After reviewing some thesis papers we decide that OpenCv will idle for our project.

OpenCV could be a library of python ties intended to unwind laptop vision. This library contains some machine learning algorithmic standard all together that we will prepare data basically and furthermore, the help of numpy makes the assignment a great deal of simpler. Numpy could be a very enhance library for numerical operations. All the openCV arrays structures area unit born again to-promotion from numpy arrays. Other than that, a wide range of libraries like Scipy, Pandas, Matplotlib that supports openCV and numpy might be utilized with this. Along these lines, openCV is associate in nursing relevant instrument for fast prototyping of laptop vision [1]. LBPH face recognizer algorithmic rule is used for face detection and acknowledge. Python offers changed decisions for creating GUI (Graphical User Interface). There are many GUI systems, the most typically used library that is tkinter out of all the GUI systems.

It's run of the mill python interface to the TK GUI toolkit conveyed with python. Python with tkinter yields the fastest and least complex approach to make the GUI applications. Import this library and choice the work and that will create responsive program, this two library are needed to develop this project [2].

In-2013 Shireesha Chintalapati et.al [3] In this paper they proposed as an automated attendance management system based on face detection and recognition algorithms. They used many more algorithms

1. Viola-Joines algorithms for face Detection
2. PCA/LDA/LBPH for feature extraction
3. SVM/Bayesian for classification

Enrollment



Figure2.2.1: Enrollment.

Recognition

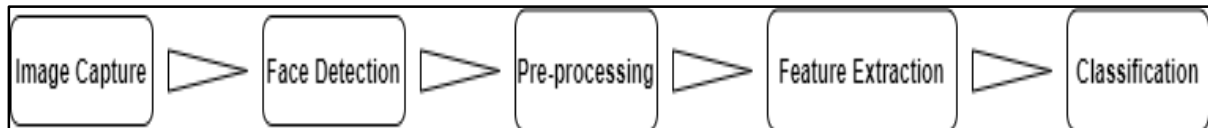


Figure2.2.2: Recognition.

System Architecture



Figure 2.2.3: System Architecture

Results of this system

Performance Evaluation Conditions	PCA + Distance Classifier	LDA + Distance Classifier	PCA + SVM	PCA + Bayes	LBPH + Distance Classifier
False Positive Rate	55%	53%	51%	52%	25%
Distance of object for correct recognition	7 feet	7 feet	7 feet	7 feet	4 feet
Training time	1081 miliseconds	1234 miliseconds	24570 miliseconds	29798 miliseconds	563 miliseconds
Recognition rate (static image)	93%	91%	95%	94%	95%
Recognition rate (real time video)	61%	58%	68%	65%	78%
Occluded faces	2.5%	2%	2.8%	2%	2.3%

Table 2.2.1: Results of this system

In the real-time scenarios, LBPH outperforms better in their system, and SVM and Bayesian were better classifiers.

In-2016 Ashish Choudhary et.al [4] In that paper they worked on an automatic attendance system based on face recognition.

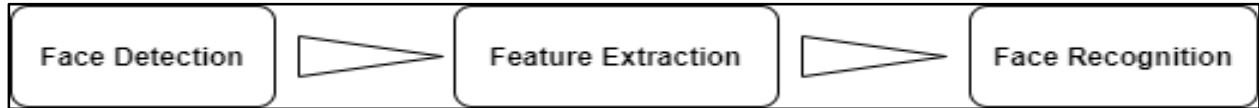


Figure 2.2.4

They used algorithms for detection and recognition.

1. Viola-Jones algorithm for Face detection.
2. PCA algorithms for Face recognition.

They followed some rules in detection.

1. The number of classifier stages.
2. The number of features in each stage.
3. The threshold of each stage.

That system worked in live like students enroll themselves when they entered the room students are counted in the database and last captured for count attendance when they out in a room.

In-2019 Rakshanda Agarwal et.al [5] In this paper delineated a method for taking attendance of students which integrated the Face recognition technology using local binary pat-tern's histograms (LBPH)algorithm and face detection by Haar feature-based cascades and distance-based clustering

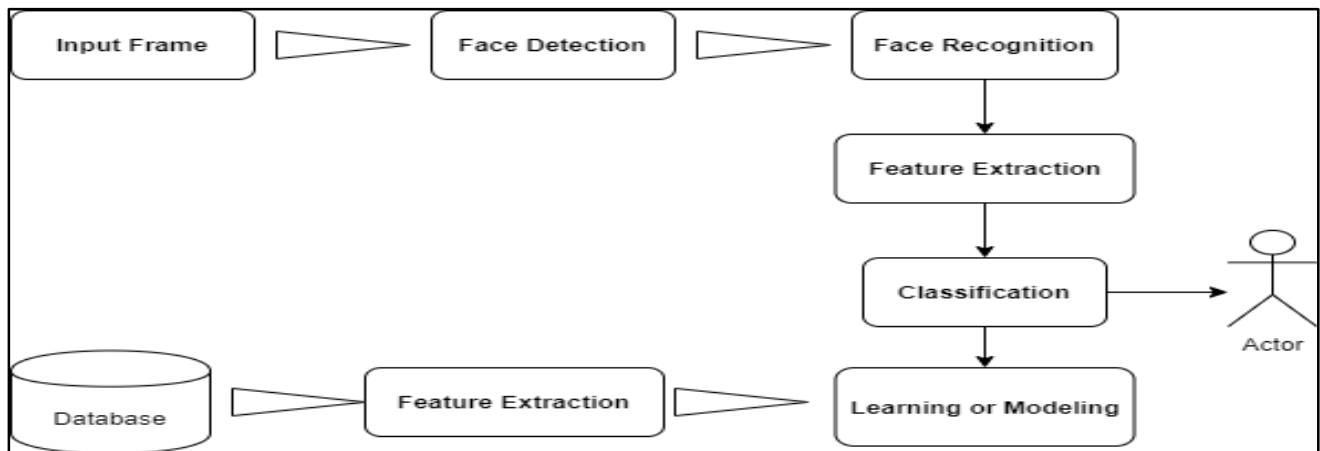


Figure 2.2.5

The results of their system good enough and also they tried to improve their system for accuracy. In-2012 Naveed Khan Balcoh et.al [6] In that paper they worked on Attendance Management System used Face Recognition based approach. They used some algorithms for detection and recognition.

“Voila and Jones” algorithm for detection and face recognition they used two techniques 1. Texture features and 2. Geometric features

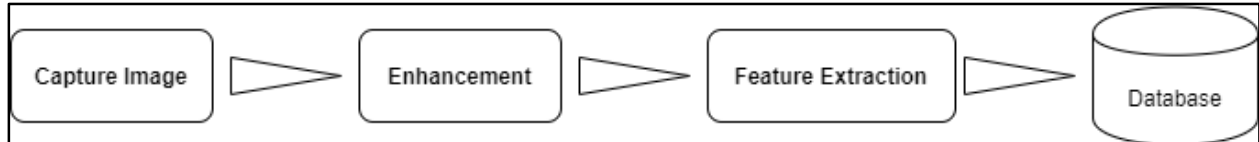


Figure 2.2.6

And they used a software algorithm in their system and the algorithm consists of some steps like

- Image acquisition
- Histogram normalization
- Noise removal
- Skin classification
- Face detection
- Attendance

The results of their system

For Face Detection

Veil	Unveil	Beard
40%	95%	75%

Table 2.2.2: For Face Detection

For Face Recognition

Veil	Unveil	Beard
2%	85%	63%

Table 2.2.3: For Face Recognition

They worked good enough but the accuracy of the veil was not good enough.

In-2017 Amey Shirke et.al [7] authors used Machine-learning Approach for automated attendance system.

They used the Sparse Fingerprint Classification Algorithm(SFCA) and that the system has two phases training and testing. They also used SIFT algorithms and it's involved by four steps

1. Scale-space Extrema Detection
2. Key point Localization
3. Orientation Assignment
4. Key point Descriptor

The results of their system of preliminary experiment showed that this system compared to the traditional black and white attendance system.

In-2017 Akshara Jadhav et.al [8] In that paper they improved the attendance system by using Face recognition with Machine learning algorithms. That system has two-stage algorithms one for Face detection and another one for Face recognition.

1. Viola-Jones algorithm they used for face detection.
2. PCA for feature Extraction.
3. SVM for classification.

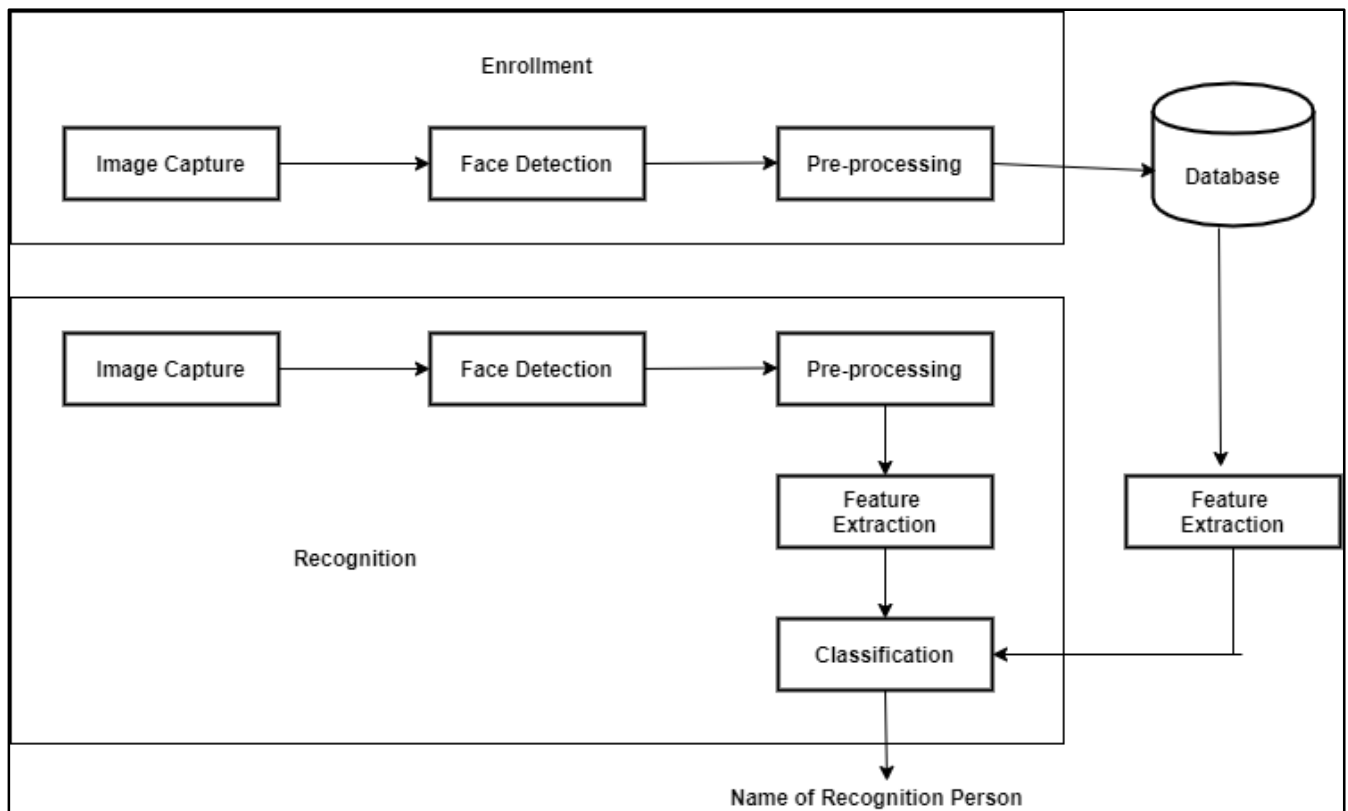


Figure 2.2.7

This project mainly based on the web and that system is simple and works efficiently.

In-2015 Khan Suhel et.al [9] In that paper they used face recognition for real-time automatic attendance systems. They used some algorithms and techniques for their system.

1. Viola and Jones for face detection
2. Correlation technique for Recognition.

That system architecture by three layers:

1. Application layer
2. System layer
3. Database layer

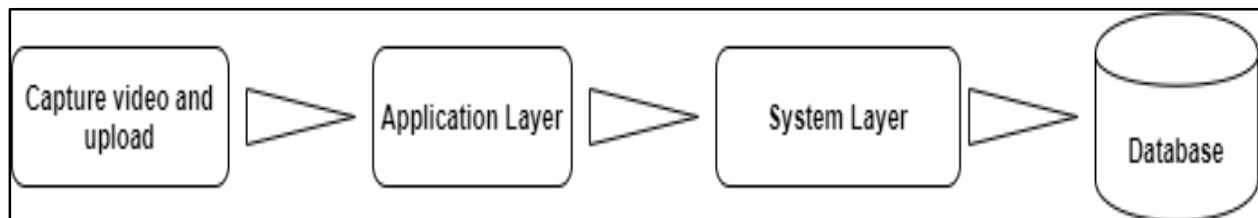


Figure 2.2.8

This system provided a good and efficient Result.

2.3 Comparative Studies

Our actualized venture is created based on AI python library. We have concentrates more all through building up this venture. We have concentrates every single necessity and framework method of that site to work our framework in a viable and proper manner.

We inquired about and find numerous comparable tasks of us yet all exactness and security is poor. The greater part of the ventures is just face discovery and face acknowledgment, those undertakings have no GUI simply has back-end. Our venture can distinguish confront and perceive additionally, spare his/her id and name in exceed expectations sheet. Our venture has easy to use GUI [10].

2.4 Scope of The Problem

We attempted to make this undertaking productive and exactness above 80% with the goal that it can perceive face accurately. As we probably are aware PC perused picture information in exhibit. Along these lines, a few faces unraveling cluster are practically same that time the recognizer precision beneath 60%. Likewise, for this venture we need to download this library in any case this task won't run, for example,

- OpenCV
- Pandas
- Tkinter
- Numpy
- CSV
- Shutil

This project will smoothly run on minimum 8gb ram laptop, if the ram is below that then it will take so time to run.

CHAPTER 3

REQUIREMENT SPECIFICATION

3.1 Introduction

Our project is a machine learning project; the system is automated attendance system based on OpenCv Face Recognition. The system works automatically and features real-time face detection and recognition for taking attendance. The GUI of this system is save time and more important its user friendly. Our project is based on machine learning python libraries. So, in this section we will discuss about the project specification requirements.

3.2 Machine Learning

Machine Learning is that the field of study that offers computers the adaptability to be told while not being explicitly customized. They're commonly acclimated tackle various sorts of life issues. Inside the more established days, people acclimated perform Machine Learning undertakings by physically mystery composing all the calculations and numerical and applied arithmetic equation. This made the technique time overpowering, dreary and wasteful. Anyway inside the popular days, it's become richly direct and efficient contrasted with the previous days by various python libraries, systems, and modules [11]. OpenCV is extraordinary compared to other AI library which utilized for PC vision, for example, object, face identification and acknowledgment.

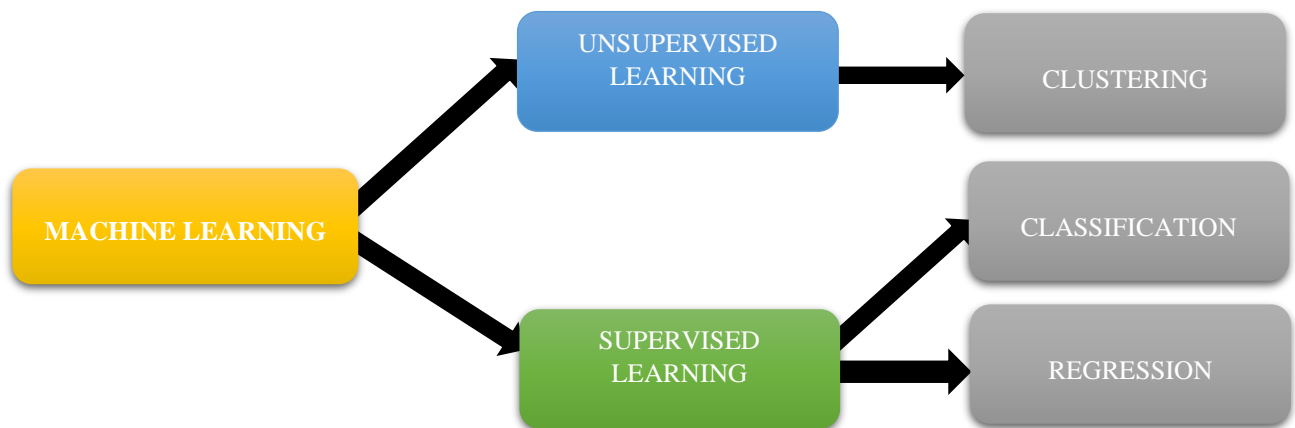


Figure 3.2.1: Machine Learning

3.3 Machine Learning and Libraries

Machine Learning is that the field of study that gives computers the ability to discover while not being explicitly modified. They're generally acclimated unravel various sorts of life issues. Inside the more seasoned days, people acclimated perform Machine Learning errands by physically committal to composing all the calculations and numerical and applied science recipe. This made the technique time overpowering, dull and wasteful. Anyway inside the in vogue days, it's gotten basically basic and affordable contrasted with the previous days by various python libraries, structures, and modules. Python libraries that utilized in Machine Learning are:

- PyTorch
- Keras
- OpenCV
- Scipy
- Scikit-learn
- TensorFlow
- Pandas
- Numpy
- Matplotlib

From those libraries three of them we used for our projects [12]. Those are OpenCV, Pandas, Numpy.

OpenCV

OpenCV is the monstrous open-source library for the computer vision, machine learning and picture handling and now it has a key influence continuously process which is extremely fundamental in the present frameworks. By utilizing it, one can system pictures and recordings to order items, faces, or in any event, penmanship of a human. At the point when it joined with various

for investigation. To distinguish picture structure and its different congregations we use vector space and perform estimated procedure on these highlights. By utilizing haarcascade record openCV distinguish faces.

Pandas

In computer programming, pandas is a software library composed for the python programming language for information impact and investigation. Specifically, it offers information structures and procedures for impacting numerical tables and time arrangement.

At the point when we need to utilize pandas for information examination, we for the most part use it one of three unique ways:

1. Convert a python's rundown, word reference or numpy exhibit to a panda information outline.
2. Open a neighborhood document utilizing pandas, typically a CSV record, however could likewise, be an encircled book record, exceed expectations, and so forth.

We use pandas for spare our participation list in a CSV position in exceed expectations.

3.4 Ide and python library

IDE

An integrated development environment (IDE) is a product application that manages total offices to software engineers for programming advancement, An IDE regularly contains of at any rate a source code editorial manager, assemble computerization devices, and a debugger. For this task we utilized python IDE and Sublime text tool.

Python Library

Python library might be a variety of capacities and methodologies that licenses you to play out a few activities while not composing your code.as a model, the python imaging library (PIL) is one

in everything about center libraries for picture control in python. Pad is partner degree effectively created fork of PIL. OpenCV python might be a library of python pointed are constant pc vision and picture process. Each library contains a huge scope of supportive modules that may import in programming [13].

There is some typically most used important library for machine learning project. Such as:

- Tkinter - Python GUI library.
- Matplotlib – A numerical plotting library.
- pyGtk – Python GUI library.
- Scipy – Algorithm and mathematical tools.
- Scrapy – For web scraping.
- Numpy – Provides math function.
- SQLAlchemy – A database library.
- Pillow – Imaging library.
- Pandas
- PIL

From those libraries five of them we used for our projects. Those are Tkinter, Numpy, Pillow, PIL and Pandas.

Tkinter:

Tkinter is the standard GUI library for Python. Python when joined with Tkinter gives a quick and simple approach to make GUI applications. Tkinter gives a ground-breaking object-situated interface to the Tk GUI toolbox. Making a GUI application utilizing Tkinter is a simple task. Python offers various decisions for creating graphical UI. Out of all the graphical UI methodologies, tkinter is most ordinarily utilized procedure. Tkinter gives different controls, for example, catches, marks and text encloses utilized a GUI application. These controls are usually called widgets. There are currently so many types of widgets in Tkinter. For our project we used few of them, Such as:

- Button – it's used to display buttons in project application.
- Entry – it's used to show a single – line text field.

- Frame – used as a container.
- Message – used for multiline text.
- tkMessage – used to display message.

Python with tkinter yields the snappiest and least demanding technique to make the graphical UI applications. Making a graphical UI exploitation tkinter is a clear task. Our project front end design is based on this library. We used it because it's easy for user.

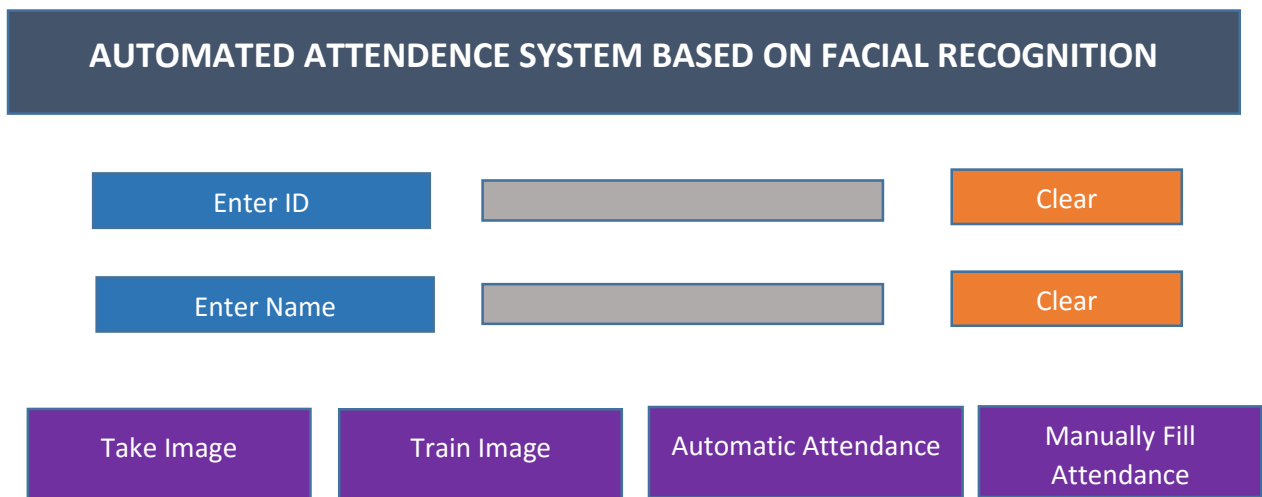


Figure 3.4.1: Tkinter GUI of our project.

Numpy:

NumPy is an open source Python bundle for logical figuring. NumPy underpins enormous, multidimensional exhibits and grids. NumPy clusters are quicker contrasted with Python records. Numpy is pondered as one of the most well-known machine learning library in python. TensorFlow, OpenCV and different libraries utilizes Numpy inside for playing out various procedure on Tensors and OpenCV. Cluster interface is the best and the most significant element of numpy.

Features of Numpy

- A powerful N – dimensional array object.
- Sophisticated function.
- Useful linear algebra, random number capabilities and Fourier transform.
- Makes coding genuine simple and getting a handle on the thoughts is easy.
- Numpy is intelligent and simple to utilize.
- Varieties complex scientific activity basic.

We utilize this library for unraveling our pictures and give a semantic exhibit.

Pillow:

Pillow is an image processing python library or Python Imaging Library (PIL), which includes support for opening, controlling, and saving images. The present variant recognizes and peruses an enormous number of organizations. Compose support is deliberately confined to the most usually utilized exchange and introduction formats.

To manipulated our images of our project we use this library.

3.5 Data Flow Diagram

A data-flow diagram is a method of speaking to a flow of data through a procedure or a framework (typically a data framework). The DFD likewise gives data about the yields and contributions of every substance and the procedure itself. A data flow sheet (DFD) could be a graphical outline of the "flow" of information through Associate in nursing information framework displaying its technique perspectives. A DFD is ordinarily utilized as a fundamental advance to frame a blueprint of the framework while not broadly expounding. DFD likewise can use for the picture of information process (organized structure).

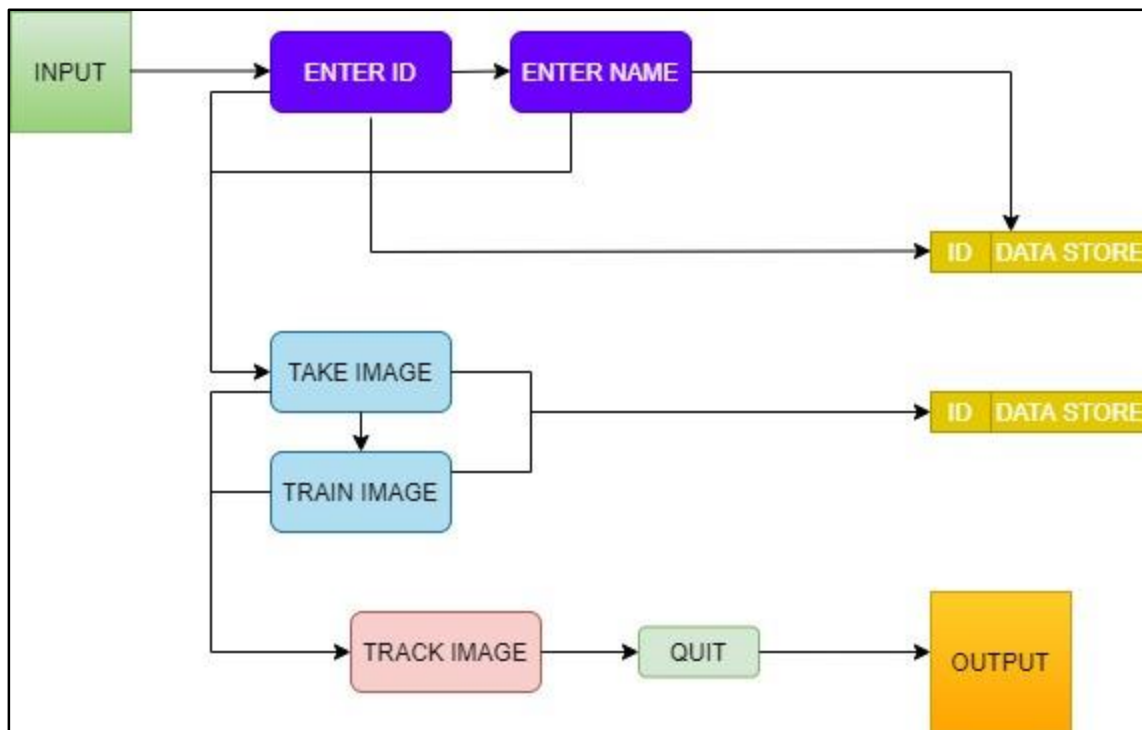


Figure 3.5.1: DFD of this project.

CHAPTER 4

DESIGN SPECIFICATION

4.1 Front – End Design

The front end design basically a design format of system or project. The front end design is displaying as GUI design. This is the main attraction of a project. This is the method of correspondence between the clients and the back end. Front end design otherwise called customer side turn of development. We made a GUI design based on front end design for the users to use this system easily.

In our system, we think about our users how they can easily co-operate this project. So, based on them we use Tkinter GUI python library for the front end design to make it user friendly.

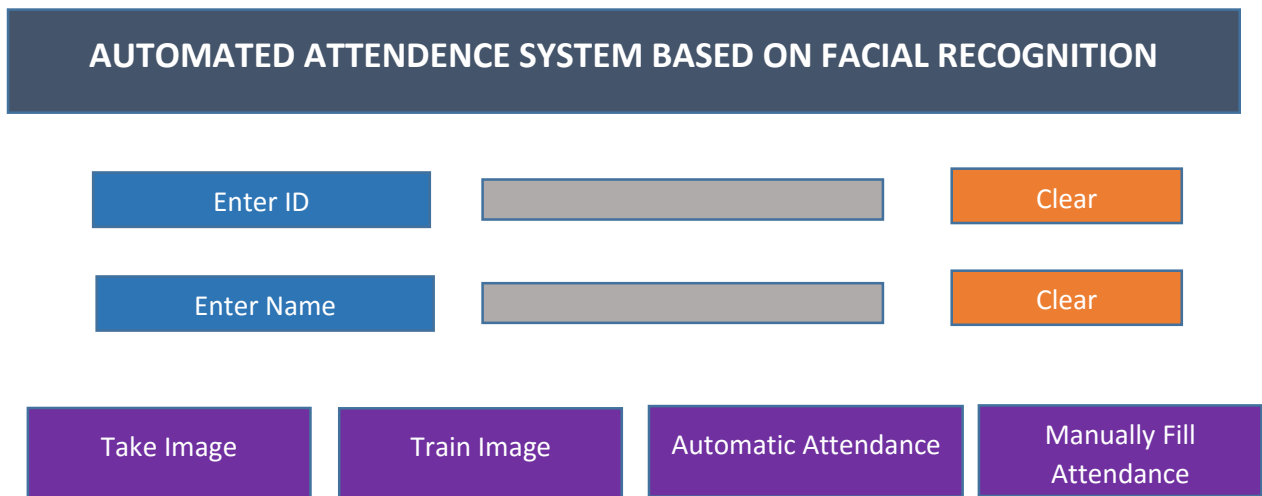
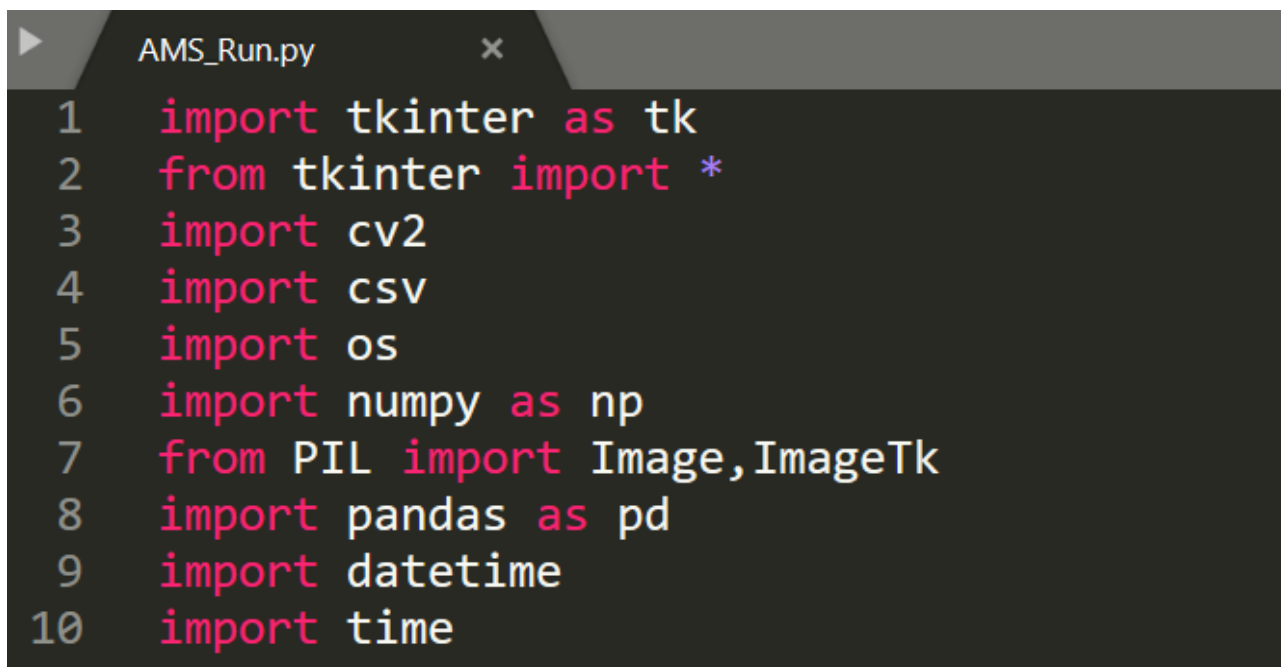


Figure 4.1.1: Front end design.

4.2 Back End Design

A project is fulfilling or completely done when back end design is properly done. The essential part of a project is back end design work. Basically the main part is back end.

In our project we use few of machine learning python libraries that we used in the back end design and create this system. Those are openCv, Tkinter, Numpy, pandas and pillow.



```
AMS_Run.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, ImageTk
8  import pandas as pd
9  import datetime
10 import time
```

Figure 4.2.1: Back End Design.

PSEUDO CODE

Initialization:

Select how to get image

open file dialog to select image

Create Bitmap -> P

Put new image in P

Send P, image-viewer width, height and quality = 70

to Resize new image and set it's quality 70

Calculate time

Add log -> DB

Figure 4.2.2: Back End Design.

CPU part (Face Detection)

Load Haar cascades XML and objects -> H
H -> detect (P)
Create new CPU bitmap P_CPU
Send H.result -> P_CPU
Calculate time
Add log -> DB

Figure 4.2.3: Back End Design.

CPU part (Face Saving)

```
If (P_CPU not = empty) then
    P_gray -> P_CPU.grayscale
    Take face name from GUI P_name
    Create image file P_file
P_file -> P_gray
    P_file.name = P_name + random
    Number
    Save P_file in Hard Disk
Calculate time
```

Figure 4.2.4: Back End Design.

CPU part (Get Image and Label):

Step 0: Input images from users.
Step 1: Identification of camera position.
Step 2: Frontal face detection.
Step 3: Compare with taken images from dataset.
Step 4: Label the images with the taken images.
Step 5: Set date and time of the labeled images.
Step 6: Repeat 0 to 5 for every students.
Step 7: Finish.

Figure 4.2.5: Back End Design.

Manually Input:

Step 0: Manual insert start.

Step 1: Enter present student ID.

Step 2: Enter present student name.

Step 3: Course name of present class.

Step 4: Course code of that class filled by conducting teacher.

Step 5: Repeat 1 to 4 for every student and following classes.

Step 6: Finish.

Figure 4.2.6: Back End Design.

4.3 Experimental Result

In section we are going to display our experiment of our project. To check the system performance and it's works properly or not, it's called experimental result. The experimental result of us project is given below:

The first window will show when we run the project that is,

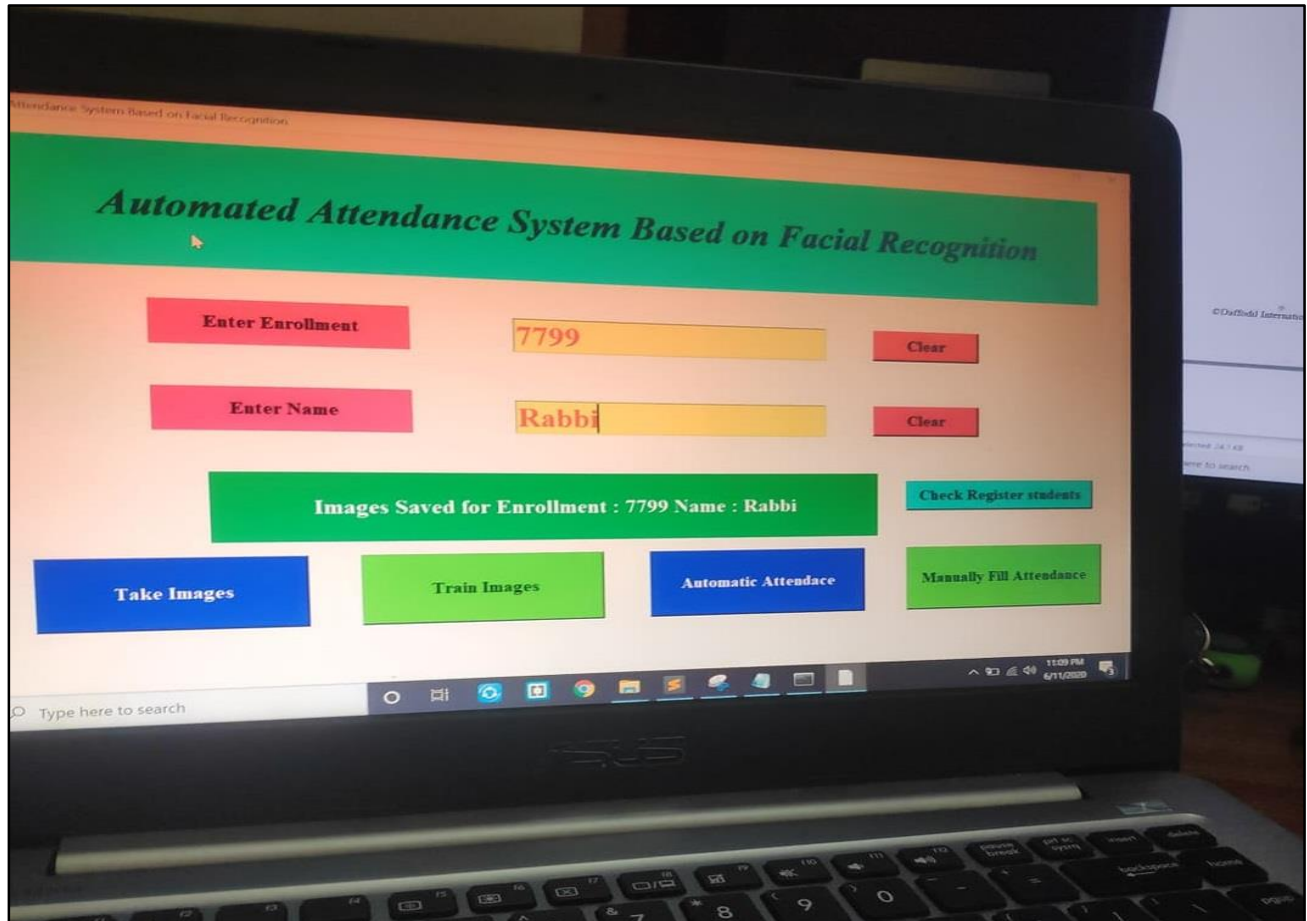


Figure 4.3.1: Experimental result 1

After that will show the train image result:

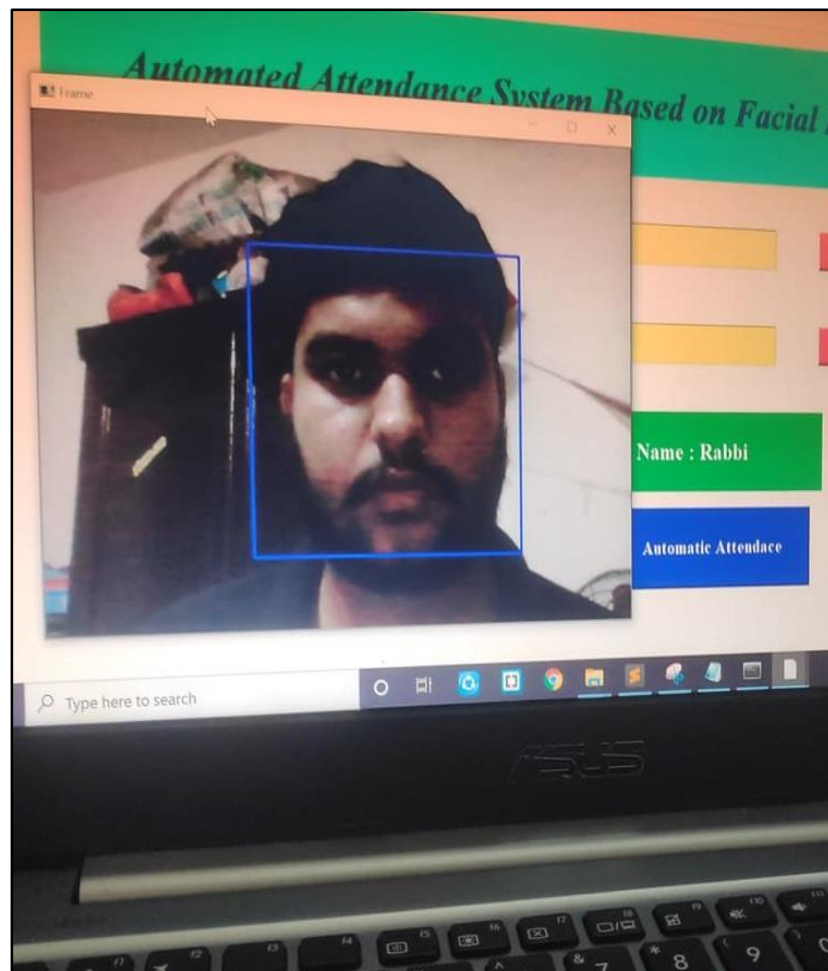


Figure 4.3.2: Experimental result 2

Our project take real time face and store it in database.

CHAPTER 5

IMPLEMENTING AND TESTING

5.1 Take Image

All machine learning projects are act like machine when its train like a machine. So, it's important to train a machine to take output from it. So, for our system we have to train and it would be for our dataset. We use openCV and Pillow so that it detects real time face and capture images and saved in to the dataset. We set the capturing the images into 70 pieces at a time so that accuracy will accurate. The image filter is gray when it will take images.

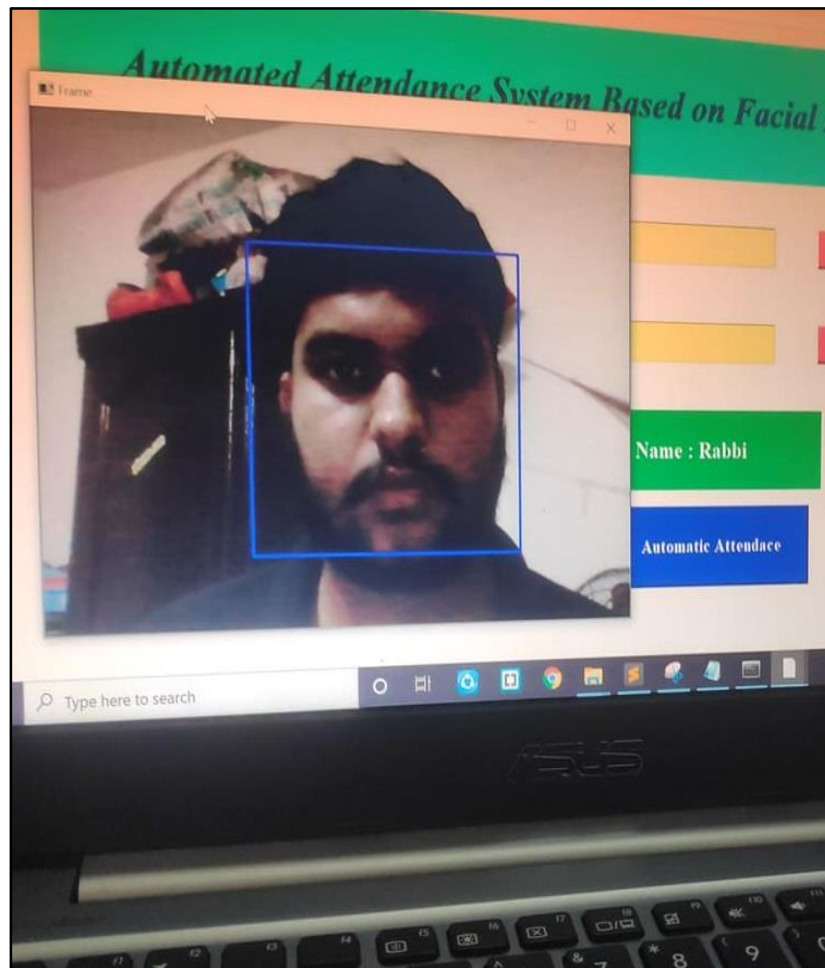


Figure 5.1.1: Take Image

Taken images of our system is given below. The images are set of 70 pieces. So, every users have taken 70 pieces' images at a time.



Figure 5.1.2: Taken Image

5.2 Implementation of Dataset

Dataset is a collection of a data. It depends on the work how the dataset will arrange. In machine learning project, it's so important. If the dataset is not properly done, then project will never run properly. More data have more efficiency. There are many format of dataset, such as CSV, JSON EXCEL format.

We set our project database automatically after taking images. We use Pandas and Pillow python libraries so that images, name and id will save automatically in the folder where Students details and Training image folder has.

Serial	Student ID	Student Name
1	77	Avir
2	22	Tusar
3	30	Tanvir
4	45	Sadi
5	50	Piya
6	11	Fazle
7	99	Rabbi
8	86	Yasmin
9	55	Faiza
10	15	Arif

Figure 5.2.1: Dataset.

Image dataset from taken images.



Figure 5.2.2: Image Dataset.

5.3 Training Image

To train image, there are some algorithm in machine learning. In our project we use one of them that is LBPH face recognizer. Its work so easily. The algorithm is so simple and easy to understand and it's the easiest algorithm for image training. This algorithm has some requirement to execute, that is the images should be grayscale filter.

This algorithm is already built in openCV library so we don't need to execute this for our project.

The interface features a dark blue header with the text "AUTOMATED ATTENDENCE SYSTEM BASED ON FACIAL RECOGNITION". Below the header, there are two rows of input fields. The first row contains a blue button labeled "Enter ID", a gray text input field, and an orange button labeled "Clear". The second row contains a blue button labeled "Enter Name", a gray text input field, and an orange button labeled "Clear". At the bottom of the interface, there are four purple buttons arranged horizontally: "Take Image", "Train Image", "Automatic Attendance", and "Manually Fill Attendance".

Figure 5.3.1: Train Image.

5.4 Recognize Image

We use OpenCV library for recognize faces. Its contains an algorithm that can recognize easily. In our project when taken images are saved in dataset and trained then we need to press track image button for recognize. The accuracy of this above 70%.

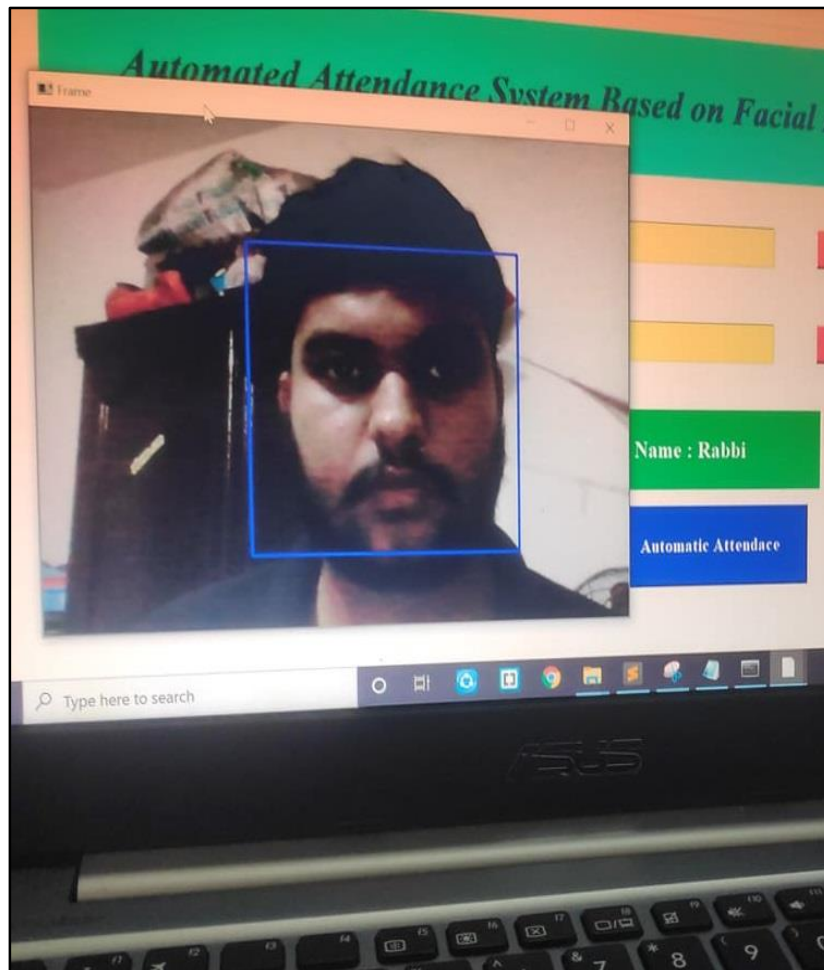


Figure 5.4.1: Face Recognize.

5.5 Test Results and Reports

The test report is needed to reflect testing brings about a proper way, which gives an extension gauge testing results expediently. Our undertaking has need pictures for a great many training that picture it can perceive the pictures. In our GUI take picture, train picture, track picture and quit four catch is dealing with by back end code. At the point when we press take picture web cam will open and begin catching pic it will catch 70 image of individual in 10 secs at that point picture will have spared. Train catch will prepare our pictures and track catch will perceive train pictures. LBPH calculation assists with preparing pictures and this calculation worked in OpenCV library. This is an easy to understand GUI. This can be utilized in numerous parts. This test report is significant and it is hard to realize that the framework is prepared or not prepared for execution. Given some image of our task test results. The report of our task is it's working consummately [13].

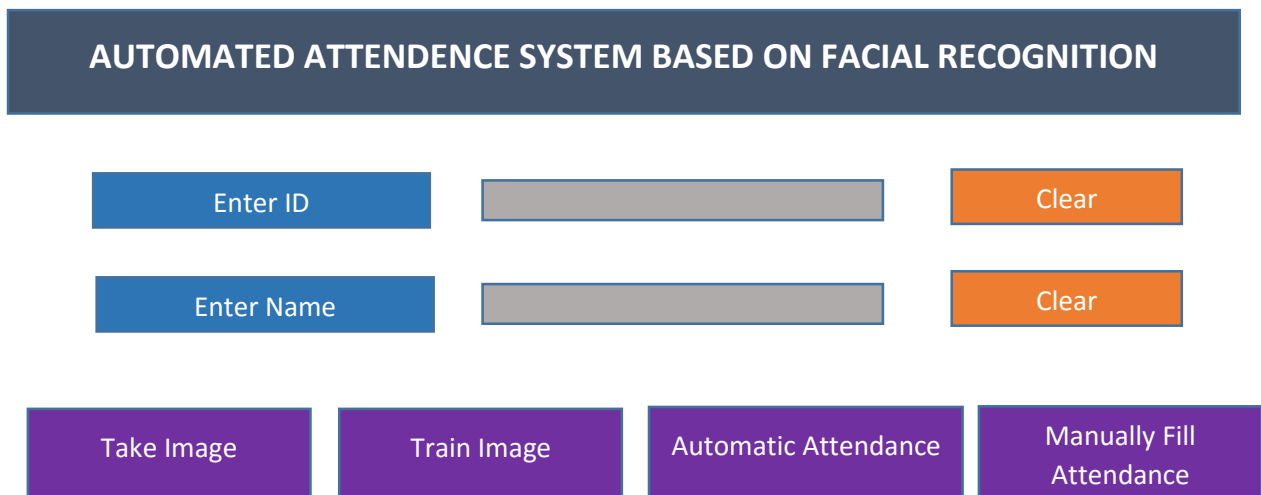


Figure 5.5.1: Test Result 1

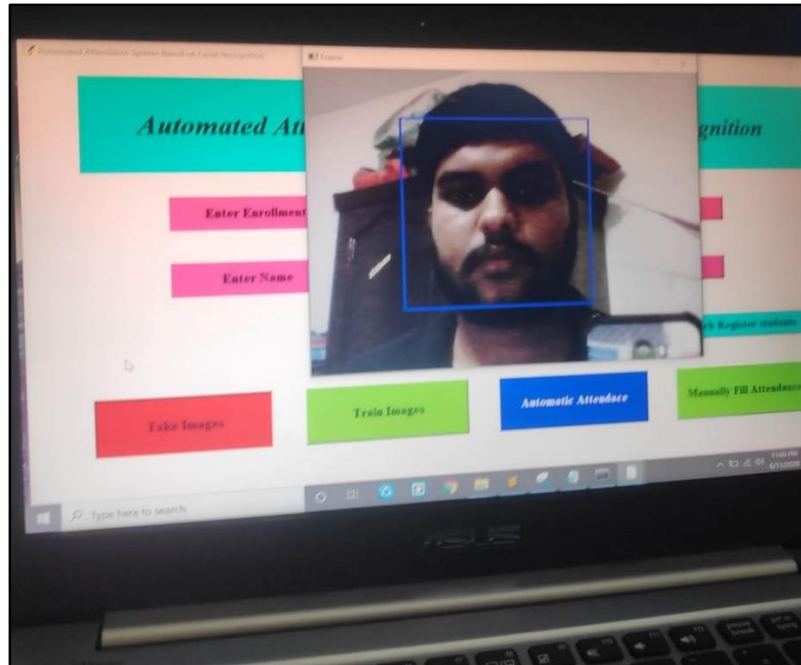


Figure 5.5.2: Test Result 2

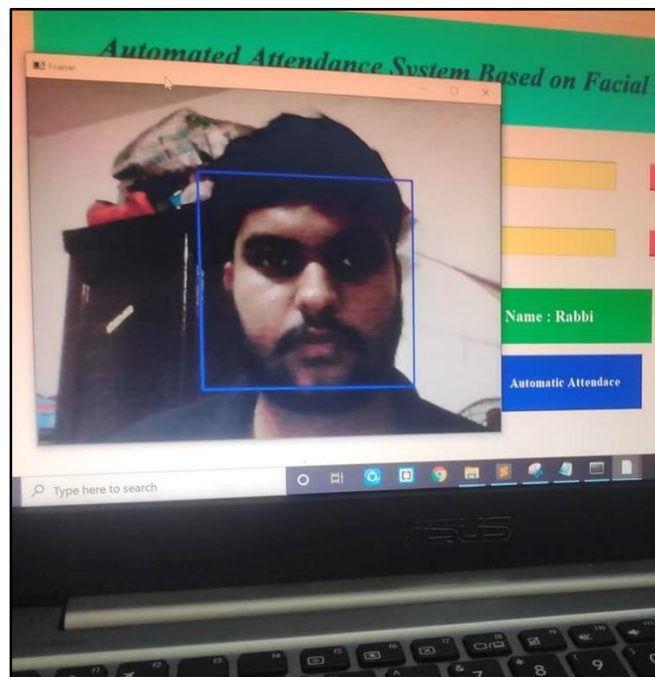


Figure 5.5.3: Test Result 3

Serial	Student ID	Student Name
1	77	Avir
2	22	Tusar
3	30	Tanvir
4	45	Sadi
5	50	Piya
6	11	Fazle
7	99	Rabbi
8	86	Yasmin
9	55	Faiza
10	15	Arif

Figure 5.5.4: Test Result 4



Figure 5.5.5: Test Result 5

Test Implementation

Test Case	Test Inputs	Expected Outcome	Obtained Outcome	Pass / Fail	Tasted On
1. Run	Laptop Python Environment	Show GUI	Not Showed GUI	Fail	10.06.2020
2. Import Library	Train and Track Image	Successfully Train and Track image	Successfully Train and Track image	Pass	10.06.2020
3. Take Image	Save image data	Successfully saved	Successfully saved	Pass	10.06.2020

Table 5.5.6: Test Implementation.

5.6 Implementation of Requirements

This project based on machine leaning project and so execute it we need python. So it's a python based we built it in the python environment. There are some requirements we need for implementation this project. Those are:

- python environment
- python IDE
- download and import machine learning libraries
- download and import python libraries
- high resolution webcam
- 8gb ram laptop/computer with idle processor.

CHAPTER 6

CONCLUSION AND FUTURE WORK

6.1 Discussion and Conclusion

This project assists with gauging participation effectively and it's an advanced time project. Presently AI utilized in each division and makes our life simple and basic. Simply set a web camera catch picture and train those pictures then those pic will perceive consequently. This venture sort of beta task. This venture will accompany more precision of face acknowledgment. Toward the end we attempted to make this undertaking great and proficient.

6.2 Future Plan

Day by day all the technic and features will have upgraded for our better purpose. We live this era that has rapidly upgrade so the machine learning also upgrade.

Our system based on openCV library and in future we want to update our system. To make us project more efficient, add more functions and make it more accuracy. There some addition that we will do in the future like:

- Detect various objects.
- Multiple face detects.
- Create big dataset.

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APPENDIX

Project Reflection

In our previous semesters we had a chance to learn and gather knowledge about the data mining, machine learning. The courses are basically fundamental, so we just introduce normally. But although it's a fundamental course are biased us and we get interest about the machine learning. Then we learn how it works and what are the applications it has. Then we decided to make a project related to this field. After some searching we are set to make project that can detect and recognize. So after that we share our idea to our supervisor and then he suggests us to build a system that can take attendance automatically. Then we get to work and after so many obstacles and complexity in our project finally complete.

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