Tribhuvan University

Faculty of Humanities and Social Sciences

Face Recognition Employee Management System

A PROJECT REPORT

Submitted to

Department of Computer Application
Patan Multiple Campus
Patan Dhoka, Lalitpur

In partial fulfillment of the requirements for the Bachelors in Computer Application

Submitted by

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6th semester

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Patan Multiple Campus

SUPERVISOR'S RECOMMENDATION

I hereby recommend that this project prepared Under my supervision by **Kritartha Baniya** entitled "**Face Recognition Employee Management System"** in the Partial Fulfillment of requirement for the degree of Bachelor in Computer Application is recommended for that final evaluation.

.....

Dadhi ram Ghimire

SUPERVISIOR

Faculty Member

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Patan Multiple Campus

LETTER OF APPROVAL

This is to certify that this project prepared by **Kritatha Baniya** entitled "**Face Recognition Employee Management System"** in the partial fulfillment of requirement for the degree of Bachelor in Computer Application has been evaluated. In our opinion it is satisfactory in the scope and quality as a project for the required degree.

…… **SIGNATURE of Supervisior** Dadhiram Ghimire Faculty Member Bachelor in Computer Application PatanDhoka, Lalitpur	…… **SIGNATURE of HOD/Coordinator** RoshanTandukar BCA Coordinator Bachelor in Computer Application PatanDhoka, Lalitpur
…… **SIGNATURE of Internal Examiner** **Internal Examiner**	…… **SIGNATURE of External Examiner** **External Examiner**

ACKNOWLEDGEMENT

I have taken a lot of effort in this project. However, it would not have been possible without the kind support and guidance of many individuals. I would like to express my gratitude towards all those helping hands who guided for preparing this project, which was a great learning process for me.

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Special thanks to my friends for their unending support they have provided in this project. It is through their encouragement and constant prayers that I was able to come this far with my studies. I would like to thank the rest of the teachers for their contribution towards this projects.

.

Yours sincerely,
Kritartha Baniya

ABSTRACT

Face Recognition Employee Management System is an web application that was developedand designed with the sole objective of automating face recognition attendance. The system was intended to address the current problem experienced in many online website which hasnot fully automated the face recognition attendance.

This system aimed at automating the face recognition attendance and provides staffs the attendance details. A number of tools were used to implement this system. They include: Python, tkinter, OpenCV, image processing concept, Microsoft Office 2013, and Draw.io. In reference to this system's objective, a fully automated Face Recognition Staff Attendance System was developed using the mentioned tools. This system's performance meets the organization's requirements. Hence providing the main benefit of concentrating all the face attendance service with the power of the mouse click and feeding the data in the system.

Keywords: Tools, Attendances, Take images, Recognitions

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LIST OF ABBREVIATIONS

DBMS	Database Management System
DFD	Data Flow Diagram
ERD	Entity Relationship Diagram
GUI	Graphical User Interface
PK	Primary Key
MySQL	Open Source Relational Database Application
SRS	Software Requirement Specification
XAMPP	Cross-Platform Apache MariaDB PHP and Perl
OpenCV	Open Source Computer Vision Library
Tkinter	TK GUI Toolkit

CHAPTER: 1 INTRODUCTION

1.1 Introduction

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.

Face Recognition Employee Management Systemis a web-based application with facial attendance scheduling functionality. This system allows the organization to detect the face of an individual and then recognize it through webcam and mark them as present .Whereas the existing system used to take attendance manually which increases the proxy in the attendance. 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 Employee Management System. The main objective of proposed system is to allow attendance to the staffs using face recognition-based algorithms to achieve fail proof attendance system. The system contains the data of the staffs present in the organization so the application through live video will take attendance if detected face is found. If new record needs to be added then the system has the feature of creation and update.

1.2 Problem Statement

Nowadays, manual system is also used by many organizations which may harm the system from various aspects so this system stores the data in database which makes easy to track all the attendance of staffs. The intention of developing Face Recognition Employee Management System is to computerized the traditional way of practicing attendance. It assiststo access the attendance information of a specific staff in a certain way. It also avoids proxyof attendance. Data accuracy is affirmed within a short span of time.

1.3 Objectives

The main objectives of this system is to produce a fully Face Recognition Employee Management System which manages the attendance of staffs. The main objectives of system are as follows:

- To detect the face segment from the video frame.
- To classify the feature in order to recognize the face detected. .
- To record the attendance of the identified staff.

1.4 Scope and Limitation

1.4.1 Scope

This site conducts the general process of marking the attendance through face. Organization can use this application. They are:

- Staff can use it for taking automatic attendance.
- An excel sheet is created which contains the attendance.
- This site is meant to transform the normal system to a more efficient computerize face attendance system.

1.4.2 Limitations

Face Recognition Employee Management System has tried to fulfill all the organizations needs although due to the time limitation there are few limitation. They are:

- Small images size makes face recognition more difficult.

- Some time there may occur pose problems and also the system cannot detect face with masks.
- The training time for our classifier takes about 20sec each person. Hence for large number it will be time consuming. Though training the classifier isn't something that needs to be done frequently done, but it would be better if it takes lesser time.
- 100 images for person is taken which would consume massive space to store images.
- Camera load speed is slow.
- Liveness in camera and fake photo in camera is not separated.
- Time barrier is not placed.

1.5 Development Methodology

Face Recognition Employee Management System performs agile methodology where agile is used to perform different phase of tasks by breaking with continuous improvement at each phase. Here the phase are divided into mainly three steps, they are registration phase, training phase and recognition phase. The registration phase consists of storing images datasets and details of the staffs. The training phase consists of extraction of face embedding and the recognition phase consists of implementation of LBPH algorithm and taking the attendance.

Figure 1. 1 Figure For Agile Development Methodology

1.6 Report Organization

Chapter 1 deals with the introduction of the system which tells about the system and what work it does. Then the problem statement is written that talks about the problem of the existing system and to solve this problem objectives is written which is overcomes the existing problem and adds the extra feature according to the customers need. It also describes about scopes where this application can be used and about the limitations that comes while using this application.

Chapter 2 deals with background study which tells about existing systems features and then describe about the literature review which includes the various opinion of international as well as national authors about the parlor management system.

Chapter 3 deals with the necessary requirements about the system which includes the functional and non -functional requirements. Functional requirement is used to verify the functionality of the website and non- functional requirement is used to verify the performance of the website. Then it describes about the feasibility study which tells about the resource's availability, cost estimation of the website development, benefits of the website after its development and cost to be incurred on its maintenance are considered. Likewise, ER diagram is describing about the entities with attributes and their relationships and the DFD shows the way information flows in the system. Whereas architectural design describes identifying the subsystem making system and the frameworks for subsystem communication and control. Further database schema is used to organize data into separate entities and interface design uses to build the interface in website. Physical DFD describes system implementations.

Chapter 4 deals with the implementation of the system that describes about the tools used, programming languages and database platforms. Here we have tested system taking some of test case and comparing it with our expected results.

Chapter 5 deals with the conclusion and lesson learnt in this project. We have included our experience and skills that we have learnt throughout the project in lesson learned section.

CHAPTER: 2 BACKGROUND STUDY AND LITERATURE REVIEW

2.1 Background Study

Mainly the existing system are made manually. There is always a chance of forgery i.e one person signing the presence of the other one. The calculations related to attendance are also done manually. Whereas it is difficult to maintain a database or register in manual system. It is being used for various reason but not limited to help admin in identifying, verifying and searching the attendance of a person over a large database of staffs.

2.2 Literature Review

Authors in proposed a model of an automated attendance system. The model focuses on how face recognition incorporated with Radio Frequency Identification (RFID) detect the authorized students and counts as they get in and get out form the classroom. The system keeps the authentic record of every registered student. The system also keeps the data of every student registered for a particular course in the attendance log and provides necessary information according to the need [1]. In this paper, authors have designed and implemented an attendance system which uses iris biometrics. Initially, the attendees were asked to register their details along with their unique iris template. At the time of attendance, the system automatically took class attendance by capturing the eye image of each attendee, recognizing their iris, and searching for a match in the created database. The prototype was web based [2]. Authors in researches to get best facial recognition algorithm (Eigenface and Fisherface) provided by the Open CV 2.4.8 by comparing the Receiver Operating Characteristics (ROC) curve and then implemented it in the attendance system. Based on the experiments carried out in this paper, the ROC curve proved that, Eigenface achieves better result than Fisherface. System implemented using Eigenface algorithm achieved an accuracy rate of 70% to 90% [3] .

In authors proposed a method for student attendance system in classroom using face recognition technique by combining Discrete Wavelet Transforms (DWT) and Discrete Cosine Transform (DCT). These algorithms were used to extract the features of

student's face followed by applying Radial Basis Function (RBF) for classifying the facial objects. This system achieved an accuracy rate of 82% [4].

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 [5].

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 6/35 effective and can also give rise to fraud as any unauthorized person can use the card for fake attendance [6].

Local Binary Pattern Histogram (LBPH) is a simple yet very efficient texture operator which labels the pixels of an image by thresholding the neighborhood of each pixel and considers the result as a binary number. LBPH extracts local features in the face and match it with the most similar face image in the database. LBPH is a method that works by dividing the face image into several blocks. Histograms will be calculated for each block and in the matrix we compare the pixels with the center pixel. At the end we will get a binary number which will be converted to decimal format. It will be combined together under one vector which will help to recognize the face in the database.

A simple rectangular Haar like feature can be defined as he differences of the sum of pixels of areas inside the rectangle, which can be at any position and scale within the original image. A Haar-like feature considers neighboring rectangular regions at a specific location in a detection window, sums up the pixel intensities in each region and calculates the difference between these sums. First, the pixel values inside the black area are added together then the values in the white areas are summed [7].

CHAPTER: 3 SYSTEM ANALYSIS AND DESIGN

3.1 System Analysis

The Face Recognition Employee Management System goes through the system analysis which includes the planning, analysis, design, and implementation and ensures that all the components satisfy the organization need and performs efficiently.

3.1.1 Requirement Analysis

The Face Recognition Employee Management System goes through the system analysis which includes the planning, analysis, design, and implementation and ensures that all the components satisfy the organization need and performs efficiently.

i. Functional Requirement

The Face Recognition Employee Management System describes a particular behavior or function of the system when certain conditions are met. For example: “when login in, a response is shown to use other feature”. It uses USECASE diagram.

In Face Recognition Employee Management System there are two actors: admin and staff where admin can perform login, staff details, attendance details and exit from admin panel. Likewise, staff can take attendance through camera.

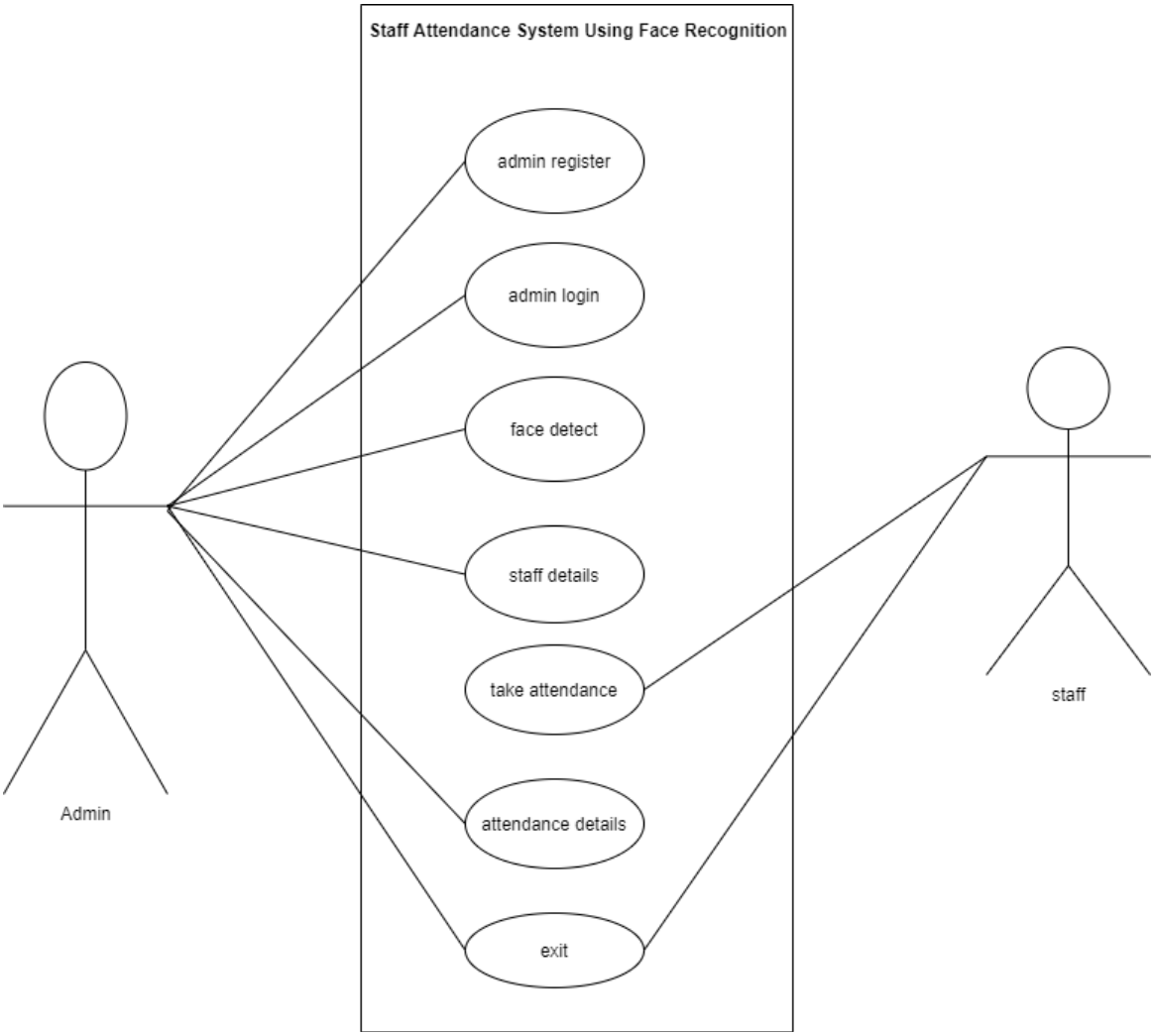


Figure 3. 1 Use Case Diagram For Face Recognition Employee Management System

R1: Admin Register

Input: Username, name and password are mentioned.

Processing: All detailed are checked and if any error are found then an error message is displayed else the username and password will be generated.

Output: Confirmation of register status.

R2: Admin Login

Input: Enter the username and password.

Processing: Enter details is checked and if error is found then admin cannot login else logged in.

Output: Admin will be able to do CRUD in website.

R3: Register Staff Details

Input: Enter the detailed mentioned and capture images to register details.

Processing: Apply Haar Cascade to detect the face and train data.

Output: Profile saved response.

R4: Manage Staff Details

Description: All the details of staffs are recorded where CRUD operation is done.

- Add Staff

Input: New details of staff are added.

Processing: Added data are checked and if they are valid then stored in database else error.

Output: Confirmation of addition.

- Update Staff

Input: Enter the name, department, phone, address etc.

Processing: Modified data are replaced with existing data.

Output: Update the list of the staff available.

- Delete Staff

Input: Click the delete in list of staff.

Processing: Destroys the data from database.

Output: Show the deletion successful.

R5: Take Attendance

Input: Staff opens camera to recognize face.

Processing: Face recognition will be done to match the face with saved faces.

Output: Attendance will be marked else shows unknown.

R6: Exit

Input: Click the exit.

Processing: Destroys the session.

Output: successful.

In Face Recognition Staff Attendance System, we divided it into two modules, or it has two actors, they are:

- Admin
- Staff

Admin Feature

- Admin dashboard.
- Admin can add/update/delete staffs.
- Admin can exit from dashboard.
- Admin can see attendance details.

Staff Feature

- Staff take the attendance through camera.
- Staff can exit from dashboard.

ii. Non-Functional Requirement

Non-functional requirements enhance the Face Recognition Staff Attendance System by running more smoothly and efficiently.

- **Availability**: This system is available for organization hour only for 365 days a year excluding holiday. The system shall be operational 8hrs a day and 6 days a week. As admin can register employee at office time from organization.
- **Security:** Admin will be able to login in the system and have access to various subsystem which will be protected by login that require the username and password.

3.1.2 Feasibility Analysis

In feasibility analysis we have analysis whether the development of Face Recognition Employee Management System is possibly sound from economic, operational, and technical point of view or not. This system can be easily used by non technical person. So, in this project it has focus on four types of feasibility analysis which are described below:

i. Technical Feasibility Study

The system is found to be technically feasible as no additional hardware or software on top of existing system is required to run the system, a simple laptop with XAMPP server installed will do. Since the system is developed using Python, tinkter and opencv the project is platform independent, it can run on any OS.

ii. Operational Feasibility Study

This project has fulfilled all the requirements of Face Recognition Employee Management System. This website could do all the operational activities easily. It is user friendly for the staff. This system is enough to handle daily attendance activities between the staff without any difficulties.

iii. Economic Feasibility Study

The project is highly economically feasible as resources required to successfully complete the project were available to download for free from the internet. There was no need to spend any financial resources on any additional hardware or software.

iv. Schedule Feasibility Study

The time frame to develop the Face Recognition Employee Management System was adequate. About three month time to create a system was divided into pairs.

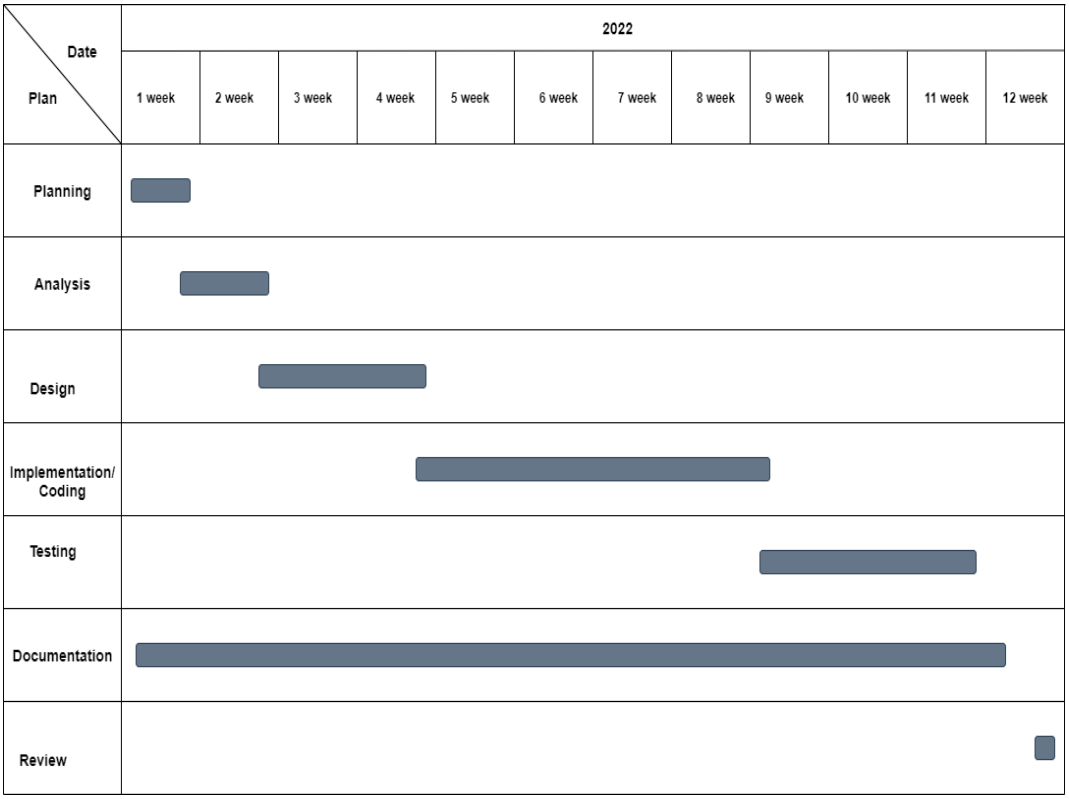


Figure 3. 2 Gantt Chart For Face Recognition Employee Management System

3.1.3 Data Modeling (ER-Diagram)

The ER diagram of Face Recognition Employee Management System consists of different entities with their attributes and shows relationship between these entities. In this ER diagram there are all together four entities with attributes. They are:

- Admin entity consists of attributes admin username and password to access dashboard.
- Admin can see the attendance details.
- Staff is able to take daily attendance through face recognition.
- Admin is able to register staff details.

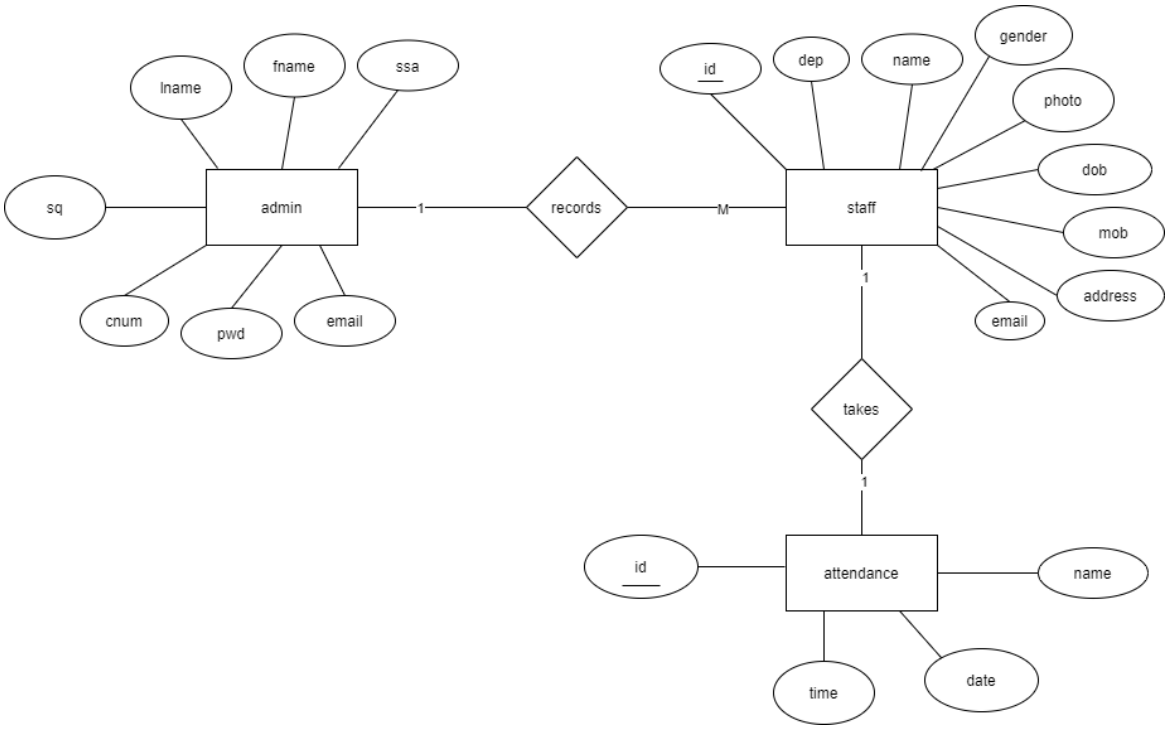


Figure 3. 3 ER Diagram For Face Recognition Employee Management System

3.1.4 Process Modeling (DFD)

The processing modelling (DFD) in Face Recognition Employee Management System is used to show the flow of data and the way data are stored in the database. In the context diagram below, staff can take attendance which is stored in database as well as excel sheet. Whereas, admin can login in the system where they can do the CRUD operation of staff details.

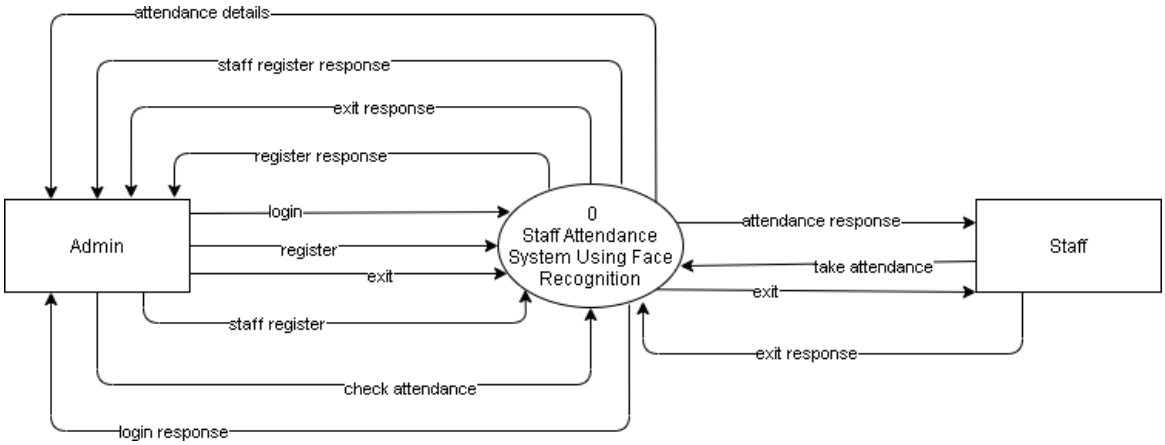


Figure 3. 4 DFD 0 Level For Face Recognition Employee Management System

DFD 1

Level 1 in below diagram, it shows the input, output and process of the Staff register and attendance. And shows how the data are stored in the database and excel sheet. Here customer can take the attendance through face recognition and if the face is matched then the attendance will be taken with real time otherwise it will display unknown and the details of attendance will be stored in database and excel sheet. Likewise, when admin login then it redirect to dashboard where admin can keep the list of staff that is working which can be also updated and deleted. In this way admin can also add/update/delete staff.

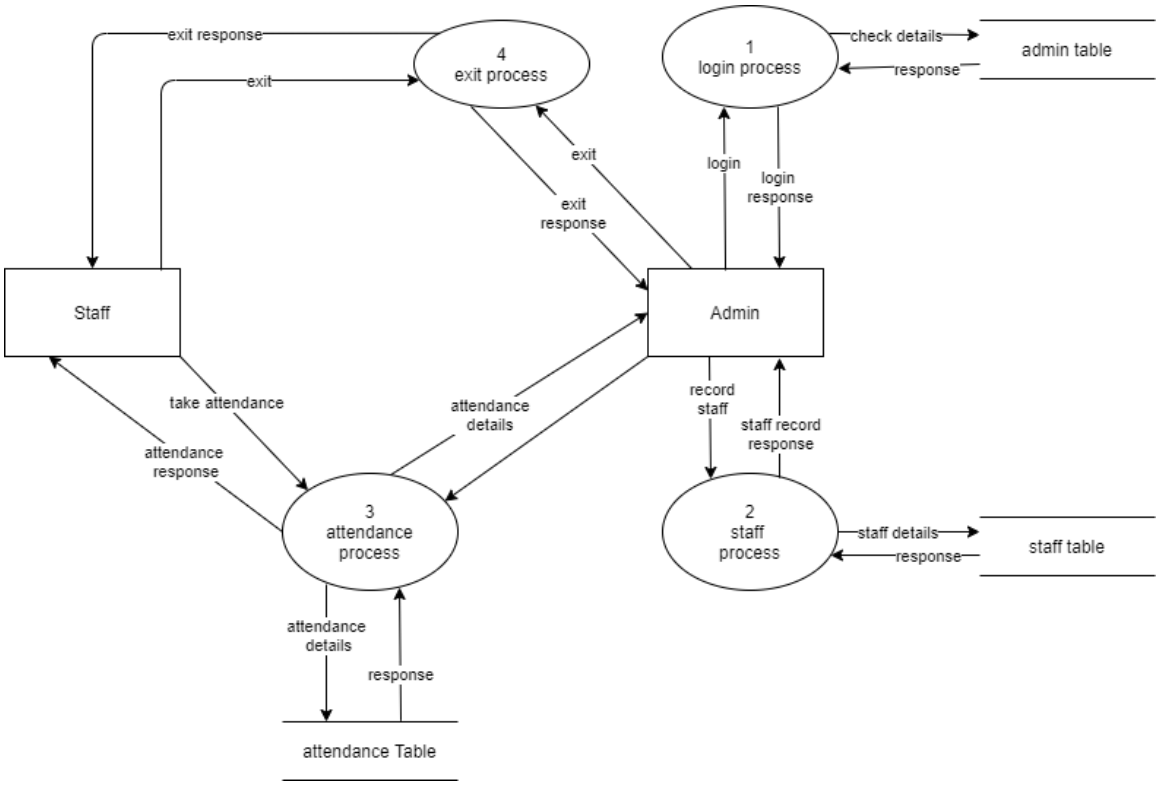


Figure 3. 5 DFD 1 Level For Face Recognition Employee Management System

3.2 System Design

The system design for Face Recognition Employee Management System are interface, architectural design, physical DFD and schema design. Here requirements of functional and nonfunctional are fulfilled.

3.2.1. Architectural Design

The Face Recognition Employee Management System makes use of the Layered Architecture. Architectural design must localize. A layered architecture applies this notion of independence and separation. The systems functionality is organized and divided into separate layers. Each layer depends on the services offered by the immediate layer beneath it. The system was developed incrementally allowing staff to access some services provided by the layers as they underwent the development. This architecture is also portable, and it can be changed easily. This system architecture is divided into several layers including the web browser, user interface, core functionality, and the operating system/database incorporate the concept of independence and separation. This allows any changes taking place to be.

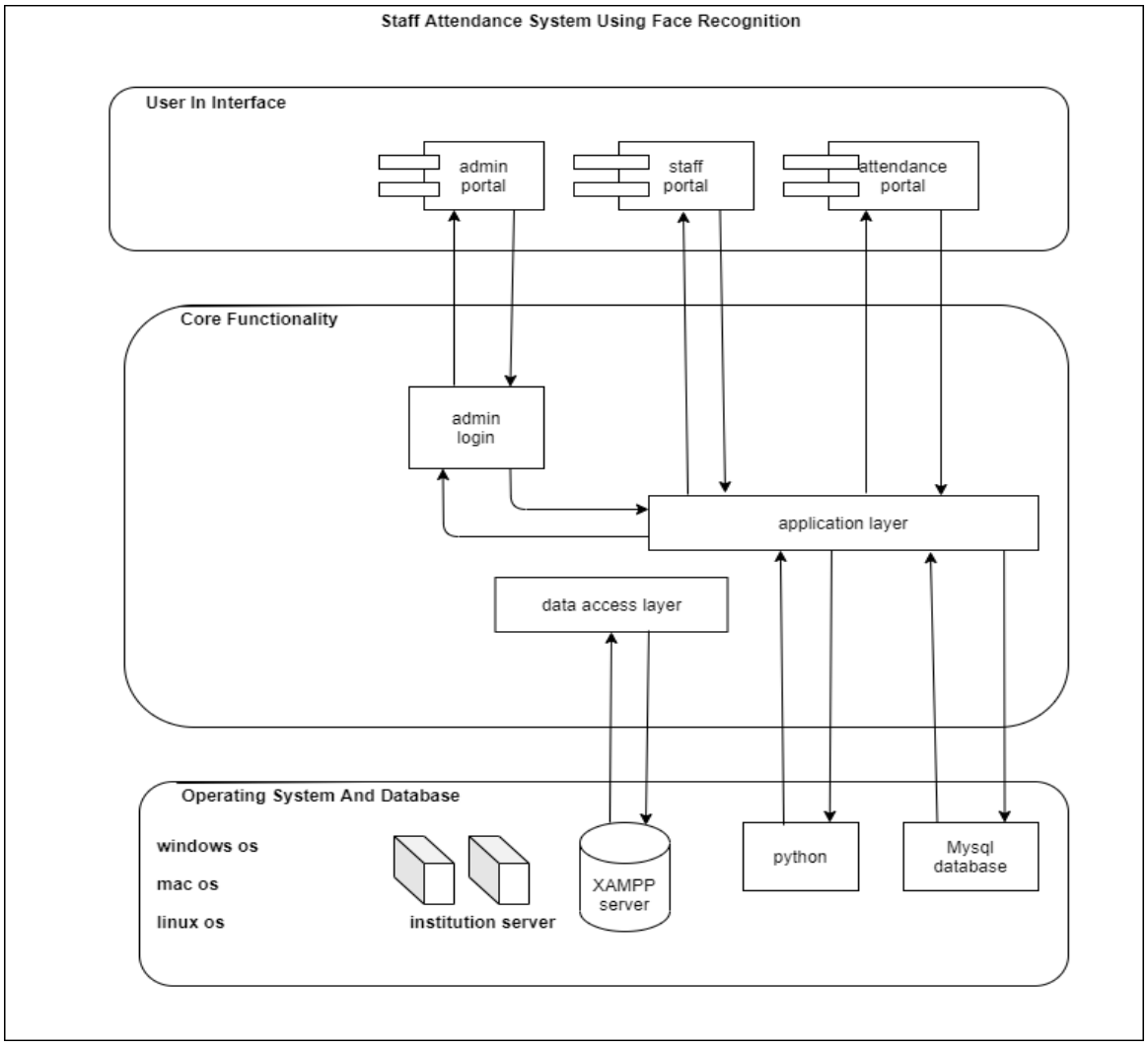


Figure 3. 6 Layered Architectural Design For Face Recognition Employee Management System

3.2.2. Database Schema Design

In Face Recognition Employee Management System there are three tables in the databaseseach of them has their own fields where their id is primary key and if that id is used in another table it becomes the foreign key. Those foreign key of another table are connect with a line.

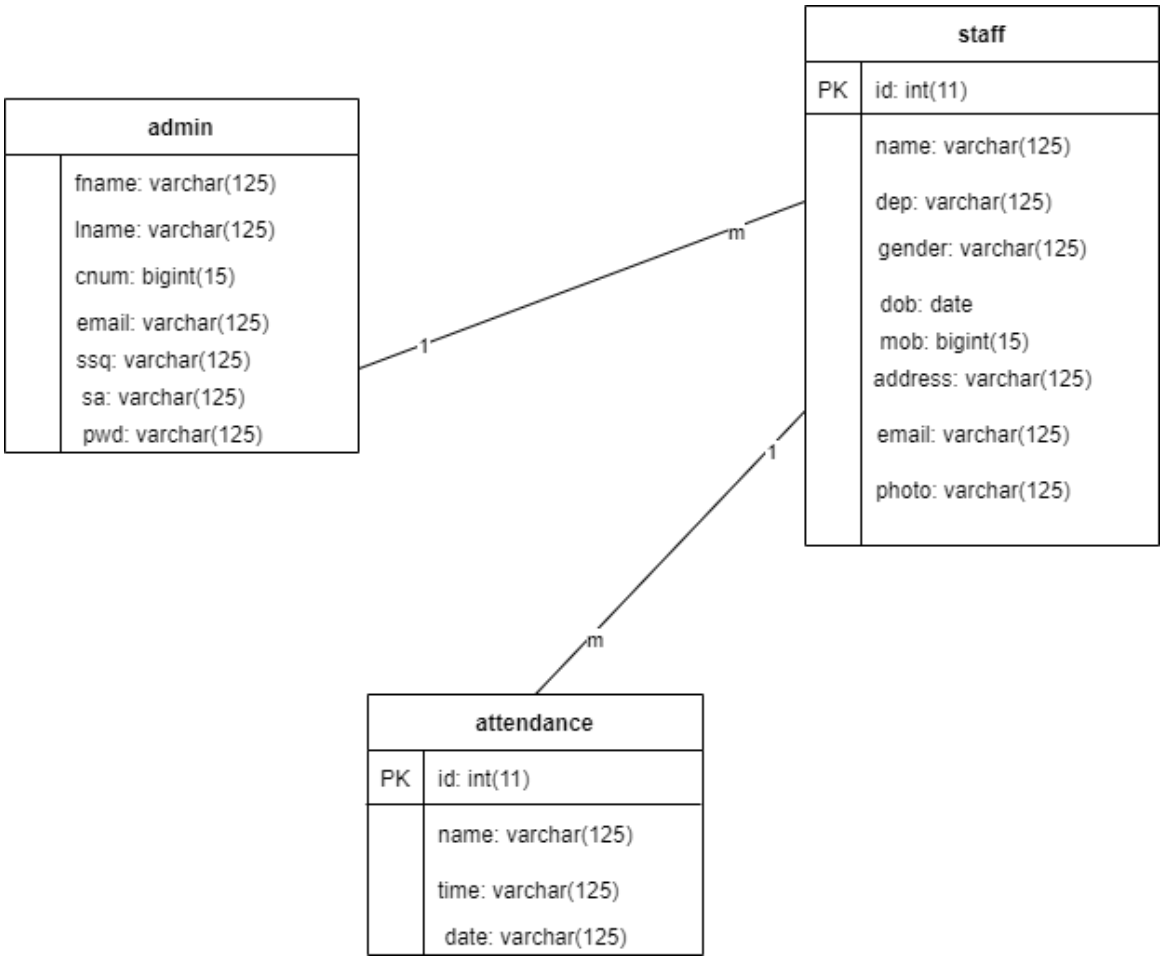


Figure 3. 7 Schema Diagram For Face Recognition Employee Management System

3.2.3. Interface Design (UI Interface / Interface Structure Diagrams)

Interface design is used to design how Face Recognition Employee Management System looks by adding all the admins needs. The design is shown to admins and after finalizing the system development starts. Below figure shows the UI design of Face Recognition Employee Management System.

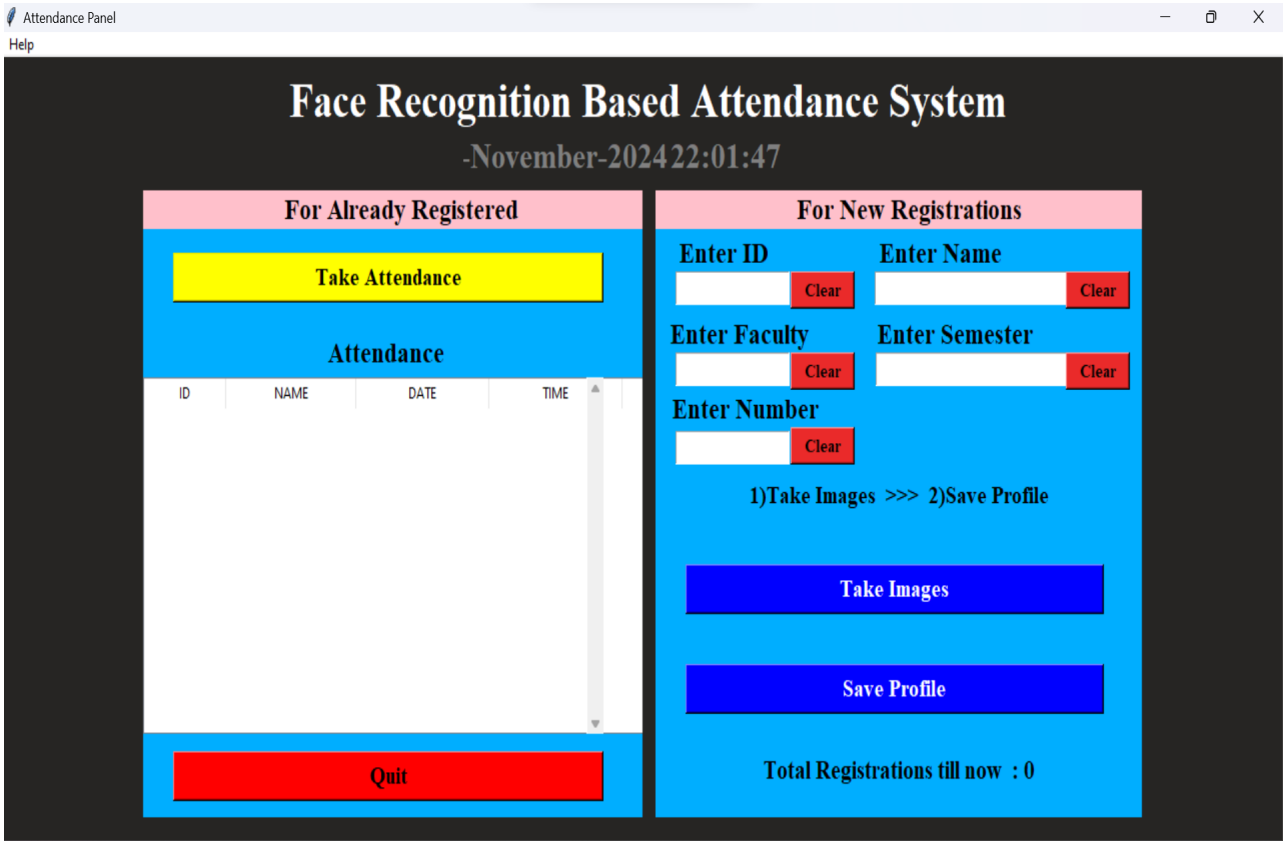


Figure 3. 8 Interface Design For Face Recognition Employee Management System

3.2.4. Physical DFD

Here, admin register and login, if it is successful user information is recorded in the database then user can register staff details. The staff details are stored in the database and excel sheet.

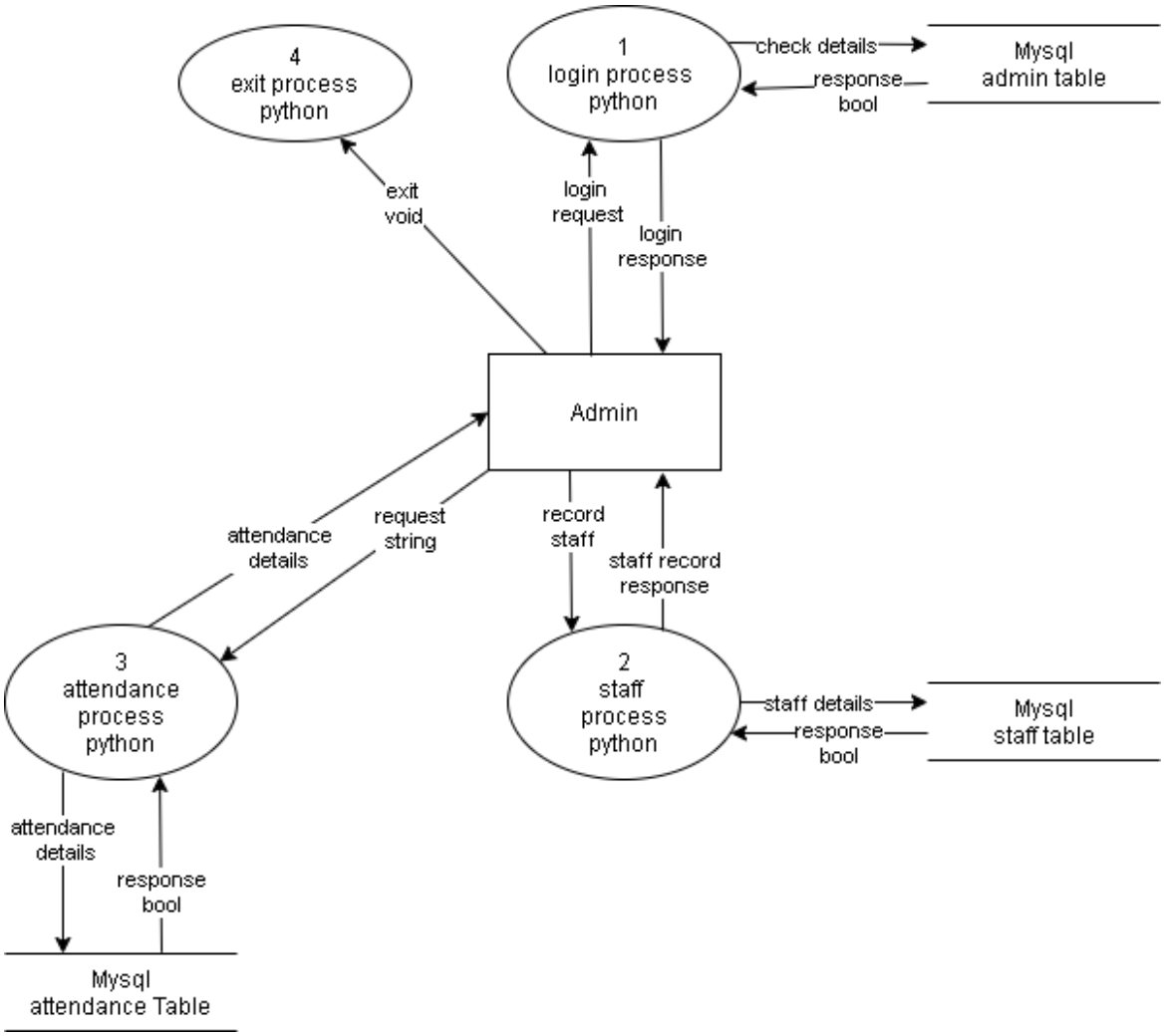


Figure 3. 9 Physical DFD For Face Recognition Employee Management System

3.3 Algorithm

Typically this process can be divided into four stages,

- **Dataset Creation**

  Images of staffs are captured using a web cam. Multiple image of single staff will be acquired with varied gestures and angles. These images undergo pre-processing. The image are cropped to obtain the Region of Interest (ROI) which will be further used in recognition process. Next step is to resize the cropped images to particular pixel position. Then these images will be converted from RGB to gray scale images. And then these images will be saved as the names of respective staffs in a folder.

- **Face Detection**

  Face detection here is performed using Haar-Cascade Classifier with OpenCV. Haar Cascade algorithm needs to be trained to detect human faces before it can be used for face detection. This is called feature extraction. The haar cascade training data used is an xml file- haarcascade_frontalface_default. The haar features shown in below will be used for feature extraction.

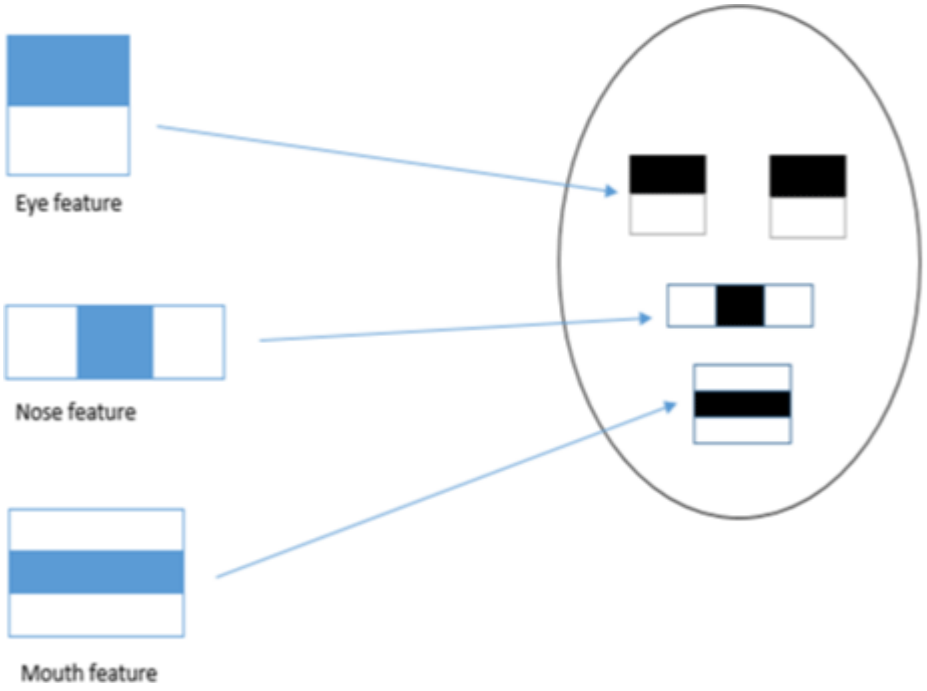


Figure 3. 10 Haar Features

- **Face Recognition**

  Face recognition process can be divided into three steps- prepare training data, train face recognizer, prediction. Here training data will be the images present in the dataset. They will be assigned with a integer label of the employee it belongs. These images are then used for face recognition. Face recognizer used in this system is Local Binary Pattern Histogram. Initially, the list of local binary patterns (LBP) of entire face is obtained. These LBPs are converted into decimal number and then histograms of all those decimal values are made. At the end, one histogram will be formed for each images in the training data. Later, during recognition process

histogram of the face to be recognized is calculated and then compared with the already computed histograms and returns the best matched label associated with the staff it belongs to.

- **Attendance**
  After face recognition process, the recognized faces will be taken with date and time and saved in excel sheet. It will take daily attendance sheet.

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.

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

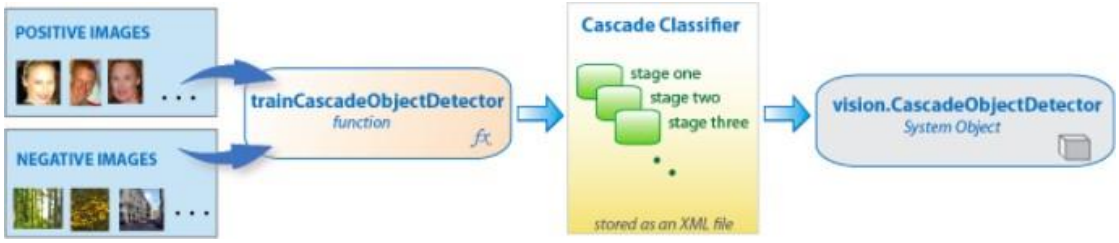
• the other is detection.

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.

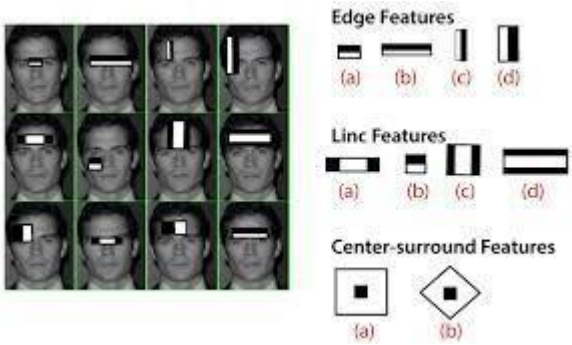
• Positive sample: It is a related image with detect objects.

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



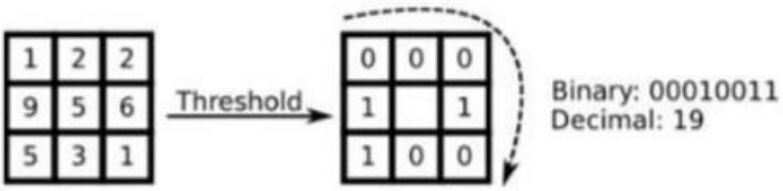
Steps of Algorithm

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.



LBPH Algorithm

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

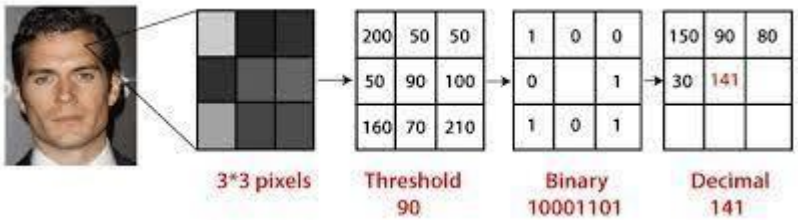


Steps of Algorithm

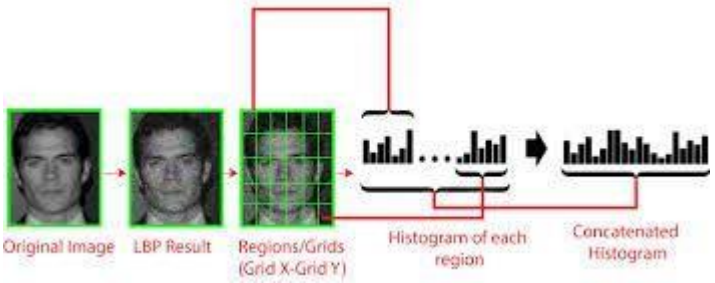
1. Selecting the Parameters:

- 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

$$D = \sqrt{\sum_{i=1}^{n} (hist1_i - hist2_i)^2}$$

Algorithm: For Admin

Step1: START

Step2: Go to home

Step3: Do you have a account?

- If yes, login to account
- Go to the admin page
- Manage detail, Image process and Manipulate
- Export the attendance detail
- No, exit
- If no, register for the account and go to step 3

Step4: STOP

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

Step1: START

Step2: Image stored in system data base

Step3: Recognization process start

Step4: Camera capture the user image

Step5: Compare with store image

- If match
- Attendance taken
- A file generated with detail
- exit, go to step4
- If no match, go to step 4

Step4: STOP

CHAPTER: 4 IMPLEMENTATION AND TESTING

4.1 Implementation

In system implementation phase, develop, install, and test the system components and deliver the system into actual use. The purpose of system implementation is to build a system, install, replace, prepare system and user documentation.

4.1.1. Tools Used

Text Editor:

- Vs code: Vs code Editor is used to implement the Face Recognition Employee Management System for coding. This interface makes easy to debug code and find out problematic portion of code for enhancement. It also has built-in plug-in that allowslive testing of code and beautifying code for easy understanding.

Library

- Tkinter: Tkinter is the standard GUI library for python. When combined with the python it provides a fast and easy way to create GUI applications Face Recognition Employee Management System.
- OpenCV: OpenCV is a great tool for image processing and performing computer vision tasks. It is open source library that can be used to perform task of face detection and recognition for staff attendance.

Backend

- Python: Python is a high level interpreter, general purpose programming language which is used to build the Face Recognition Employee Management System.
- XAMPP Server: XAMPP is a local server which runs python and Mysql for developing and testing the Face Recognition Employee Management System.

Database

- MySQL: Mysql is used to perform the CRUD operation of create, insert, update, select and delete data from the database as requested by the admin.

Documentation Tool

- Ms word: This is used for writing and editing the documentation for Face Recognition Employee Management System.
- Draw.io: This is used to draw diagram for the system analysis and design of system. Diagrams were created using this tool in order to save the time since all components are available with drag and drop functions.

Spreadsheet

- Excel: This is used to keep the records of attendance details.

4.1.2. Implementation Details of Modules (Description of procedures/functions)

A module describes information about the module and its supported components. In this project there are two module each as admin module and staff module. They are:

- **Admin**
  Admin are responsible for managing the backend and frontend. An admin creates, insert, deletes and update the staff details and attendance.

For import of attendance

Below code is used to import the attendance that has been taken by face recognition where attendance are saved to .csv file. Then attendance are imported to attendance form to store in the database.

```
def importCsv(self):

    mydata.clear()

    fln=filedialog.askopenfilename(initialdir=os.getcwd(),title="Open
CSV",filetypes=(("CSV File","*.csv"),("All File","*.*")),parent=self.root)

    with open(fln) as myfile:
```

```
        csvread=csv.reader(myfile,delimiter=",")
        for i in csvread:
            mydata.append(i)
    self.fetchData(mydata)
```

For export of attendance

Below code are used to export the attendance that have been already saved to database and for organization member to see details in the .csv format.

```
def exportCsv(self):
    try:
        if len(mydata)<1:
            messagebox.showerror("Error","No Data Found!",parent=self.root)
            return False
        fln=filedialog.asksaveasfilename(initialdir=os.getcwd(),title="Open CSV",filetypes=(("CSV File","*.csv"),("All File","*.*")),parent=self.root)
        with open(fln,mode="w",newline="") as myfile:
            exp_write=csv.writer(myfile,delimiter=",")
            for i in mydata:
                exp_write.writerow(i)
```

For detecting images

Below code are used to detect the face in camera which is done by using Haar cascade features. After taking the images they are saved with their id and images are taken for 100times for better performance.

```
face_classifier = cv2.CascadeClassifier("haarcascade_frontalface_default.xml")
            def face_croped(img):
```

```
            gray = cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)
            faces = face_classifier.detectMultiScale(gray,1.3,5)
            for (x,y,w,h) in faces:
                face_croped=img[y:y+h,x:x+w]
                return face_croped
        cap=cv2.VideoCapture(0)
        img_id=0
        while True:
            ret,my_frame=cap.read()
            if face_croped(my_frame) is not None:
                img_id+=1
                face=cv2.resize(face_croped(my_frame),(450,450))
                face=cv2.cvtColor(face,cv2.COLOR_BGR2GRAY)
                file_path="data_img/staff."+str(id)+"."+str(img_id)+".jpg"
                cv2.imwrite(file_path,face)
cv2.putText(face,str(img_id),(50,50),cv2.FONT_HERSHEY_COMPLEX,2,(0,255,0),2)
                cv2.imshow("Capture Images",face)
            if cv2.waitKey(1)==13 or int(img_id)==100:
                break
        cap.release()
        cv2.destroyAllWindows()
```

- **Staff**

  Staff are responsible for taking their attendance through the webcam which automatically takes attendance by displaying the rectangle box with their details.

For taking attendance

Below code are used to take the attendance and store in .csv file after the face recognition is done.

```
def mark_attendance(self,i,r,n):
    with open("attendance.csv","r+",newline="\n") as f:
        myDatalist=f.readlines()
        name_list=[]
        for line in myDatalist:
            entry=line.split((","))
            name_list.append(entry[0])
        if((i not in name_list)) and ((r not in name_list)) and ((n not in name_list)):
            now=datetime.now()
            d1=now.strftime("%d/%m/%Y")
            dtString=now.strftime("%H:%M:%S")
            f.writelines(f"\n{i}, {r}, {n}, {dtString}, {d1}")
```

For face recognition

Below code are used to recognize the face and provide the details by matching with the details and image take at the time of face detection.

```
  def face_recog(self):
    def draw_boundray(img,classifier,scaleFactor,minNeighbors,color,text,clf):
        gray_image=cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)
        featuers=classifier.detectMultiScale(gray_image,scaleFactor,minNeighbors)
        coord=[]
```

```
        for (x,y,w,h) in featuers:
            cv2.rectangle(img,(x,y),(x+w,y+h),(0,255,0),3)
            id,predict=clf.predict(gray_image[y:y+h,x:x+w])
            confidence=int((100*(1-predict/300)))
            conn = mysql.connector.connect(username='root',
            password='',host='localhost',database='face_recognition')
            cursor = conn.cursor()
            cursor.execute("select id from staff where id="+str(id))
            i=cursor.fetchone()
            i="+".join(map(str,i))
            cursor.execute("select dep from staff where id="+str(id))
            r=cursor.fetchone()
            r="+".join(map(str,r))
            cursor.execute("select name from staff where id="+str(id))
            n=cursor.fetchone()
            n="+".join(map(str,n))
            if confidence > 77:
cv2.putText(img,f"id:{i}",(x,y-
80),cv2.FONT_HERSHEY_COMPLEX,0.8,(64,15,223),2)
cv2.putText(img,f"dep:{r}",(x,y-
55),cv2.FONT_HERSHEY_COMPLEX,0.8,(64,15,223),2)
cv2.putText(img,f"name:{n}",(x,y-
30),cv2.FONT_HERSHEY_COMPLEX,0.8,(64,15,223),2)
                self.mark_attendance(i,r,n)
```

```
            else:
                cv2.rectangle(img,(x,y),(x+w,y+h),(0,0,255),3)
cv2.putText(img,"Unknown Face",(x,y-
5),cv2.FONT_HERSHEY_COMPLEX,0.8,(255,255,0),3)
            coord=[x,y,w,y]
        return coord
    def recognize(img,clf,faceCascade):
        coord=draw_boundray(img,faceCascade,1.1,10,(255,25,255),"Face",clf)
        return img
    faceCascade=cv2.CascadeClassifier("haarcascade_frontalface_default.xml")
    clf=cv2.face.LBPHFaceRecognizer_create()
    clf.read("clf.xml")
    video_cap=cv2.VideoCapture(0)
    while True:
        ret,img=video_cap.read()
        img=recognize(img,clf,faceCascade)
        cv2.imshow("Face Detector",img)
        if cv2.waitKey(1) == 13:
            break
    video_cap.release()cv2.destroyAllWindows()
```

4.2 Testing

During the designing process, this project has so many bugs which were debugged one by one analyzing the problem occurred on each step. This project has gone through following testing procedure.

Each module is tested to make sure it functions correctly. Later, programs are tested in groups followed by testing with the entire system. The first step in testing is to compile the program to detect any system errors. If there is an error, the programmers need to correct it until the program execute correctly. It includes unit testing and system testing

4.2.1 Unit Testing

Unit testing is done at individual level of the programs of this project. It identifies and reduces execution errors that cause the programs to terminate abnormally and logic errors that could have been missed. During unit testing we tested programs that interact with other programs and files individually.

Admin Login and Register Module

Admin register the details and when it is recorded successfully user login by filling all the details and if the data is matched it shows login success response.

Table 4. 1 Admin Login And Register Testing

Test Case	Test Data	Test Result
Register admin	Username: Ram Name: Ram Password: ram123	Registration success
Login admin account	Username: ram Password: ram123	Login success

Face Recognition by Staff Module

Staff clicks on the attendance button if it is successful it shows attendance details else doesn't takes attendance i.e: unknown image.

Table 4. 2 Face Recognition By Staff Testing

Test Case	Test Data	Expected Outcome	Test Result
Clicks attendance button	If live face match with this face	Displays details and takes attendance	Successful
Enter invalid	Unknown	Unknown image	Successful

4.2.2 Test Case For System Testing

System testing is done to test the set of input in Face Recognition Staff Attendance System whether it works correctly. It ensures that system meets its specification and any nonfunctional requirements that have been agreed with the users.

Staff Register Form Module

Admin adds the new staff on click of save, can delete the staff data on click of delete from the database and can view list of staff, can update the data.

Table 4. 3 Staff Register Form Testing

Test Case	Expected Data	Test Result
On click of save	Admin save the new staff which is stored in database	Successful
On click of delete	Deletes the data from database	Successful
On click of update	Updated data are stored in database	Successful

Attendance Form Module

Admin can add attendance on click of save, can update data, on click of delete from the database and can view list of attendance, can import and export.

Table 4. 4 Attendance Form Module Testing

Test Case	Test Data	Expected Data	Test Result
On click of save	ID: 1, Name: shyam Time: 10:21:31, Date: 11/08/2024	Admin save the imported data which is stored in database	Successful
On click of delete	ID: 1, Name: shyam Time: 10:21:31, Date: 11/08/2024	Deletes the data from database	Successful
On click of update	ID: 2, Name: shyam Time: 10:21:25, Date: 11/08/2024	Updated data are stored in database	Successful
On click of import	ID: 2, Name: shyam Time: 10:21:25, Date: 11/08/2024	Imported data are successfully shown	Successful
On click of export	ID: 2, Name: shyam Time: 10:21:25, Date: 11/08/2024	Exported data are successfully exported and saved in the computer	Successful

CHAPTER: 5 CONCLUSION AND FUTURE RECOMMENDATIONS

5.1 Lesson Learnt / Outcome

In lesson learnt we have learned lots of problem-solving skills during the project. We have also learned to recognize different errors and bugs that may occur throughout the project. We have learned how to work with team and divide out task with each other. On the other hand, we have also learned how to integrate our modules and how to communicate with teammates. We have learned how to prepare project proposal and necessary documentation related with project. Likewise, we have learned to prepare different USECASE diagram, schema diagram, ER diagram, etc. and learned to use tools to prepare these diagrams.

5.2 Conclusion

This system aims to build an effective attendance system using face recognition technique. This system will be able to mark the attendance via face id. It will detect faces via webcam and then recognize the faces. After recognition, it will mark the attendance of the recognized staff and update the recognized record. It also helps to find out the specify staffs attendance data within large data from database.

In this Face Recognition Employee Management 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.

Therefore, 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

5.3 Future Recommendations

There are certain improvements that can be done in the future. Based on the users' requirements recommendation system can be updated. Following things can be done in the future:

- Camera Load speed will increase.
- Multiple face recognition.
- The number of training images can be reduced by removing the duplicate images of the same person or images with similar embeddings.
- The training time can be reduced by retraining the classifier only for the newly added images.
- Wrongly classified images can be added to the training dataset with the correct label so as to increase the accuracy of the recognition model.
- The images of unknown images can be saved in efficient manner.
- Time barrier can be placed.
- Liveness in camera and fake photo can be separated.

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[3] S. e. a. Lukas, "Implementation of face recognition algorithm for biometrics based time attendance system," IEEE, 2014 International Conference on ICT For Smart Society (ICISS).

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[5] D. K. Yadav, S. Singh and P. Mishra, "Fingerprint Based Attendance System Using Microcontroller and LabView," 6 June 2015.

[6] F. M. Al-Naima, "A Proposed RFID Based Student Attendance System," 1 May 2015.

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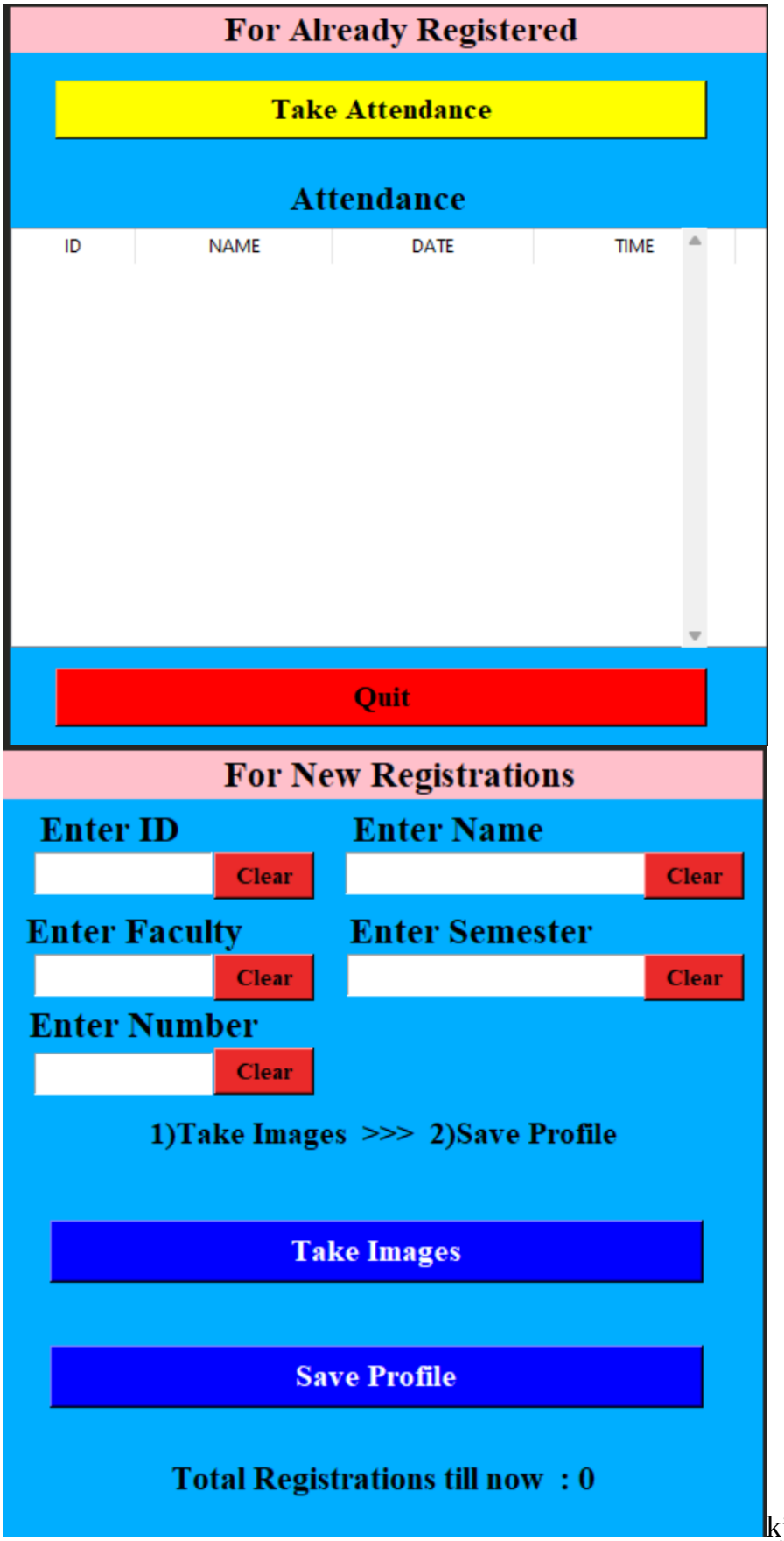
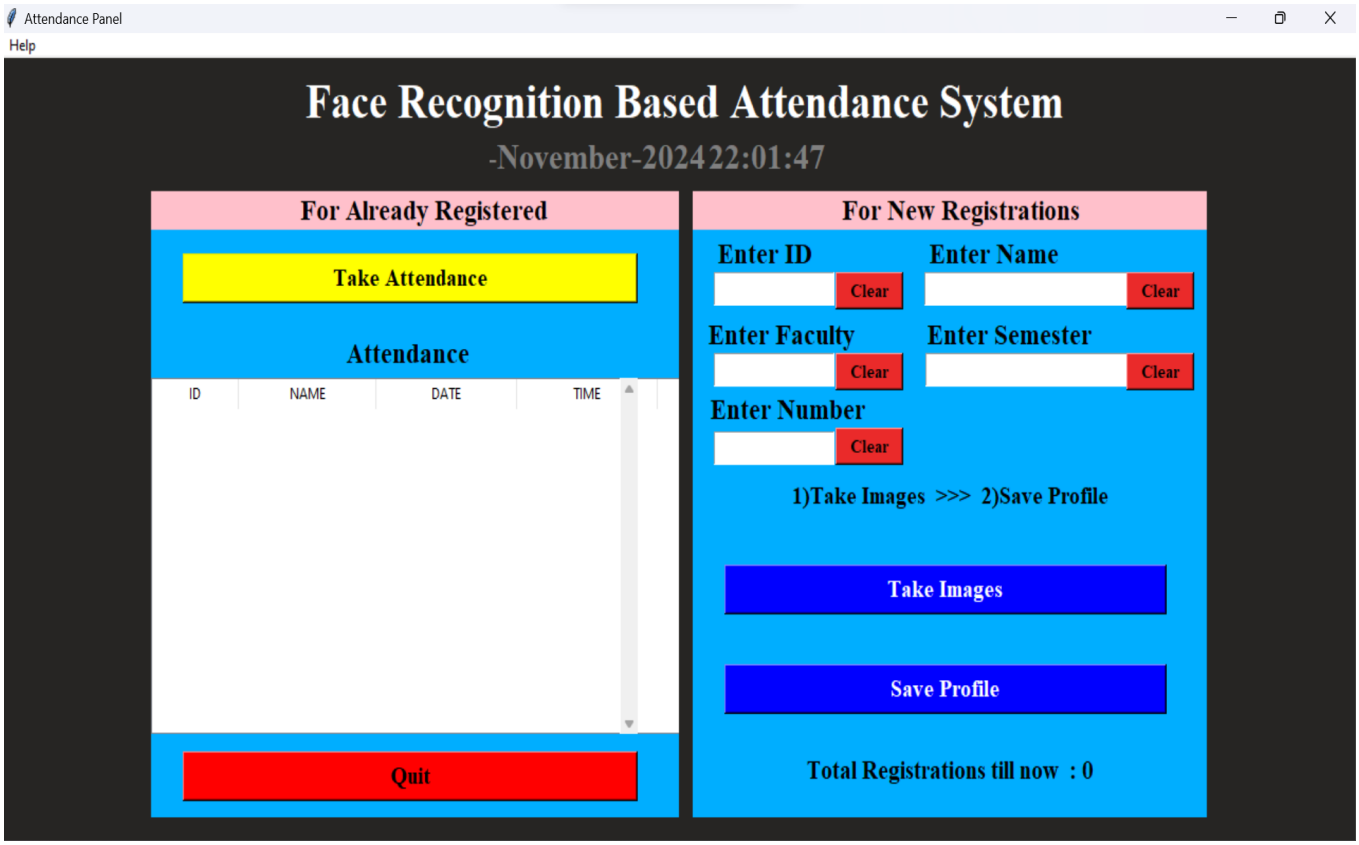
Appendix: System Screen-Shots:



kji


Attendance Panel
Help
Face Recognition Based Attendance System
-November-2024 22:01:47
For Already Registered
Take Attendance
Attendance
ID
NAME
DATE
TIME
Quit
For New Registrations
Enter ID
Clear
Enter Name
Clear
Enter Faculty
Clear
Enter Semester
Clear
Enter Number
Clear
1)Take Images >>> 2)Save Profile
Take Images
Save Profile
Total Registrations till now : 0