FaceATT: A face recognition attendance system

Submitted By

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This project report has been submitted in fulfilment of the requirements for the degree of **Bachelor of Science in Software Engineering**

APPROVAL

This project titled on "**FaceAtt**", submitted by **Shadab Pervaz Vikki (ID: 192-35-2884)** to the Department of Software Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of Bachelor of Science in Software Engineering and approval as to its style and contents.

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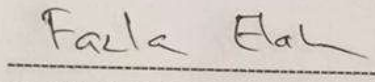

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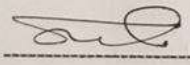

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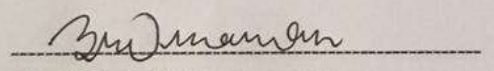

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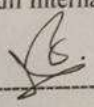

External Examiner

Dr. Md. Sazzadur Rahman
Professor
Institute of Information Technology
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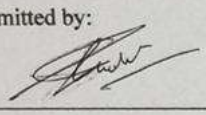
DECLARATION

I therefore declare that I have done this project under the oversight of **Mr. Khalid Been Badruzzaman Biplob, Lecturer (Senior Scale)**, Department of Software Engineering, Daffodil International University. . I also declare that this project is my original work for the degree of B.Sc. in Software Engineering and it has not been previously or concurrently submitted for any other degree at Daffodil International University or any other institution.

Submitted by:



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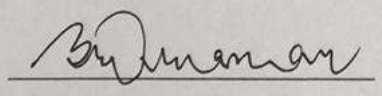

(Supervisor's Signature)

Full Name : **Mr. Khalid Been Badruzzaman Biplob**
Position : **Lecturer (Senior Scale)**
Department of Software Engineering
Daffodil International University

FaceATT: A Face Recognition Attendance System

SHADAB PERVAZ VIKKI

Project submitted in fulfillment of the requirements
for the award of the degree of
Bachelor of Science

Department of Software Engineering

DAFFODIL INTERNATIONAL UNIVERSITY

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It is a great privilege for us to express our profound gratitude to our teacher Mr. Khalid Been Badruzzaman Biplob, Lecturer (Senior Scale),Department of Software Engineering, Daffodil International University for his constant guidance, valuable suggestions, supervision and inspiration throughout the course work without which it would have been difficult to complete the work within scheduled time.

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We would like to take this opportunity to thank all the respected teachers of this department for being a perennial source of inspiration and showing the right path at the time of necessity.

Last but not least, we would like to thank to our parents, for their unconditional support, love and without this we would not have come this far.

DEDICATION

I therefore declare that I have done this project under the oversight of **Mr. Khalid Been Badruzzaman Biplob**, **Lecturer (Senior Scale)**, Department of Software Engineering, Daffodil International University. Also declare that neither entire record nor any portion of this record has been submitted somewhere else for my degree.

ABSTRACT

With the advancement of modern technologies areas related to robotics and computer vision, real time image processing has become a major technology under consideration. So here a try has been made for a novel approach for capturing images from the Web Camera in real time environment and process them as we are required. This project portrays a machine learning approach for face recognition to accomplish this process very quick with high identification rates using OpenCV. Here in this project depicts a basic and simple equipment execution of face location framework utilizing Web Camera. The framework is modified utilizing Python programming language. The destinations of the face recognition are to recognize appearances and its spatial area in any pictures or recordings. The proposed framework distinguishes the faces present in a grey scale and colored image. This project center around usage of face detection framework for human recognizable proof in light of OpenCV library with python. Here in this project the idea of identification has been built up by composing distinguishable code for dataset generator, trainer and indicator. Effectiveness of the framework is examined by ascertaining the Face recognition rate for every one of the databases. The outcomes uncover that the proposed framework can be utilized for face detection even from low quality pictures and shows incredible execution level. At last, the data that will be shown alongside recognized photograph has been put away on database. This concept has a higher scope on security and surveillance projects and various operation. 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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LIST OF SYMBOLS

<	Angle Bracket
>	Angle Bracket
/	Back Slash
“”	Double Quotation
‘’	Single Quotation

LIST OF ABBREVIATIONS

PIN	Personal Identification Number
ID	Identification
GUI	Graphical user interface
UI	User Interface
GSM	Global System for Mobile Communications

LIST OF APPENDICES

CHAPTER 1 INTRODUCTION

1.1 Background

A python GUI integrated attendance system using face recognition to take attendance. In this python project, I have made an attendance system which takes attendance by using face recognition technique. I have also integrated it with GUI (Graphical user interface) so it can be easy to use by anyone. The software first captures an image of all the authorized persons and stores the information into database. Then it uses the Face recognition technology to identify the face and simultaneously take the attendance. According to the registration of the person.

1.1.1 Context and Relevance

In today's networked world, the need to maintain the security of information or physical property is becoming both increasingly important and increasingly difficult. From time to time, we hear about the crimes of credit card fraud, computer breakings by hackers, or security breaches in a company or government building. In most of these crimes, the criminals were taking advantage of a fundamental flaw in the conventional access control systems: the systems do not grant access by "who we are", but by "what we have", such as ID cards, keys, passwords, PIN numbers, or mother's maiden name.

None of these means are really define us. Recently, technology became available to allow verification of "true" individual identity.

1.1.2 Problem Identification

According to the previous attendance management system, the accuracy of the data collected is the biggest issue. This is because the attendance might not be recorded personally by the original person, in another word, the attendance of a particular person can be taken by a third party without the realization of the institution which violates the accuracy of the data. For example, student A is lazy to attend a particular class, so student B helped him/her to sign for

the attendance which in fact student A didn't attend the class, but the system overlooked this matter due to no enforcement practiced. Supposing the institution establish an enforcement, it might need to waste a lot of human resource and time which in turn will not be practical at all.

1.1.3 Purpose and Justification

This technology is based in a field called "biometrics". Biometric access control are automated methods of verifying or recognizing the identity of a living person on the basis of some physiological characteristics, such as fingerprints or facial features, or some aspects of the person's behavior, like his/her handwriting style or keystroke patterns. Since biometric systems identify a person by biological characteristics, they are difficult to forge.

1.1.4 Scope

The main intention of this project is to solve the issues encountered in the old attendance system while reproducing a brand new innovative smart system that can provide convenience to the institution. In this project, an application will be developed which is capable of recognizing the identity of each individuals and eventually record down the data into a database system. Apart from that, an excel sheet is created which shows the students attendance.

The followings are the project scopes:

▪ The targeted groups of the attendance monitoring system are the students and staff of an educational institution.

▪ The database of the attendance management system can hold up to 2000 individual "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.

▪ The project has to work under a Wi-Fi coverage area or under Ethernet connection, as the system need to update the database of the attendance system constantly.

1.2 Project Planning and Initiation

Feasibility Study (Step-by-Step)

To implement Student attendance system based on the face recognition of webcam's image in the classroom. Provides an automated attendance system that is practical, reliable and eliminate disturbance and time loss of traditional attendance systems. Present a system that can accurately evaluate student's performance depending on their recorded attendance rates.

Phase 1 Preliminary Analysis & Project Scope Definition:

A face recognition system is one of the biometric information processes, its applicability is easier and working range is larger than others, i.e.; fingerprint, iris scanning, signature, etc.

Phase 2 Market Feasibility Analysis (or Market Research):

Back in the years, attendance management system in school/colleges was done bimanual reporting where the student's attendance was recorded by placing a mark or signature beside their name in a name list to indicate their presence in a particular class. While the staff in the institution will report their attendance through the punch card machine which also have to be done manually. Later on, some of those attendance systems had evolved into using smart cards to replace signature markings where each students/staff will be required to report their attendance using a smart card embedded with a unique identification chip.

Phase 3 Technical Feasibility Analysis:

Technical feasibility is carried out to determine whether the project is feasible in terms of software, hardware, personnel, and expertise, to handle the completion of the project. It considers determining resources for the proposed system. As the system is developed using python, it is platform independent. Therefore, the users of the system can have average processing capabilities, running on any platform. The technology is one of the latest hence the system is also technically feasible.

Phase 4 Financial Feasibility Analysis:

Financial feasibility defines whether the expected benefit equals or exceeds the expected costs. It is also commonly referred to as cost/benefit analysis. The procedure is to determine the benefits and the savings expected from the system and compare them with the costs. A proposed system is expected to outweigh the costs. This is a small project with no cost for development. The system is easy to understand and use. Therefore, there is no need to spend on training to use the system. This system has the potential to grow by adding functionalities for students as well as teachers. This can Hence, the project could have financially benefited in the future.

1.3 Target User Profile and Tentative Elicitation Process

1.3.1 Target User

My project target users are basically students, teachers and admin. Other small organization can also use this embedded system to mark their employee's attendance.

1.3.2 User profile

Table 1.1: User Profile for Students

User Class	**Note on Characteristics**
Type of user	Students
Age range	12+
Frequency of use	2 times a day
Mandatory	Yes
Computer experience	Yes
Education	Above class 6
goal	To take their attendance
Language skills	Basic English
Number of users	2000
Training	Little training required
Others system use	Not necessary
Way of working	1 student at a time can take attendance

Table 1.2: User Profile for Teachers

User Class	**Note on Characteristics**
Type of user	Teachers
Age range	25+
Frequency of use	Many times a day
Mandatory	Partially mandatory
Computer experience	Yes
Education	Yes
goal	To check student attendance
Language skills	English
Number of users	2000
Training	Little training required
Others system use	Not necessary
Way of working	Check attendance or can take students attendance

Table 1.3: User Profile for Admin

User Class	**Note on Characteristics**
Type of user	Admin
Age range	25+
Frequency of use	Many times a day
Mandatory	Yes
Computer experience	Yes
Education	Minimum B.SC in CS
goal	To maintain the application
Language skills	English
Number of users	1
Training	Training required
Others system use	Should have previous experience
Way of working	To maintain and change/add functionalities as required

1.3.3 Elicitation Process

I will use interviews to take user requirements because interviews are one-on-one sessions with stakeholders such as teachers, administrators, security personnel, and students (or end users). The objective is to gather in-depth insights into their needs, concerns, and expectations regarding the face recognition attendance system.

Steps:

- Identify Stakeholders: Teachers, administrators, students. Prepare Questions: Focus on system usability, security concerns, and the desired features (e.g., ease of use, speed, and integration with existing systems).
- Conduct Interviews: I will use open-ended questions to encourage detailed responses (e.g., “What challenges do you face with the current attendance system?” or “What features would make the system more user-friendly?”).
- Document Responses: I will capture both qualitative and quantitative insights, taking notes or recording with consent and apply them to build my project.

1.4 Project Block Diagram

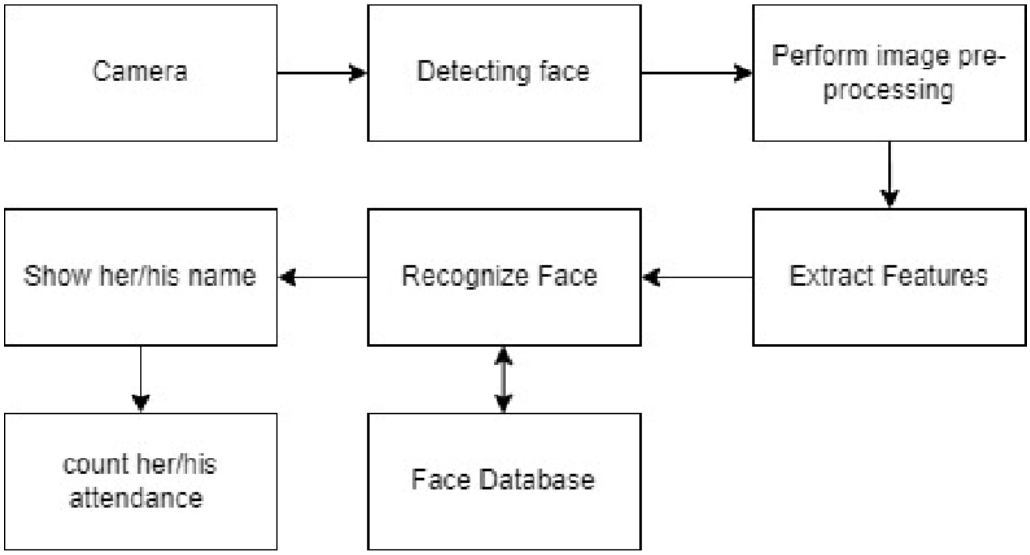

Figure 1: System Block Diagram

1.5 System Requirements

1.5.1 Hardware Requirements

Table 1.4: Specification of Hardware

Processor	1.5 GHz or upper
RAM	2 GB recommended
Disk Space	4GB of available hard disk

1.5.2 Software Requirements

Table 1.5: Specification of Software

Operating system	Windows 10,11
Database	Microsoft Excel
Text Editor	IDLE python 3.10

1.5.3 Constraints and Dependencies

• The capability of Email alerts could not be implemented.

• Email confirmation not accessible.

• The possibility of unapproved access.

• The intensity of light.

• Faces problems in detecting face especially in low light areas.

1.6 Project Scheduling

Activities	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13
Research													
Req. Analysis													
Planning													
Designing													
Development													
Testing													
Assessment													
Documentation													

Table 1.6: Gantt Chart

1.7 Summary

In this chapter, I introduce the problem or issue that the document addresses, highlighting its significance and relevance. I often included background information that helps the reader understand the scope of the Face Recognition based attendance monitoring system.

CHAPTER 2 DESIGN AND IMPLEMENTATION

2.1 Introduction

Face recognition system is a complex image-processing problem in real world applications with complex effects of illumination, occlusion, and imaging condition on the live images. It is a combination of face detection and recognition techniques in image analyzes. Detection application is used to find position of the faces in a given image. Recognition algorithm is used to classify given images with known structured properties, which are used commonly in most of the computer vision applications.

2.2 Functional Requirements

The functional requirements are:

FR01	**Registration**
Description	Before using the face recognition attendance system Students and Teachers must be registered first
Stakeholder	Students, Teachers

FR02	**Take Image**
Description	Students and Teachers must take images before saving their profile
Stakeholder	Students, Teachers

FR03	**Save Profile**
Description	Students and Teachers must save their profile to get registered
Stakeholder	Students, Teachers

FR04	**Take Attendance**
Description	After saving profile Students and Teachers can now take their attendance

Stakeholder	Students, Teachers

FR05	**Change Password**
Description	This function let the user to change the system password
Stakeholder	Teachers

FR05	**Contact Us**
Description	This function help students and teachers if they face any problem while using the system.
Stakeholder	Students, Teachers

FR05	**Exit**
Description	This function let the user exit the system
Stakeholder	Students, Teachers

2.3 Non-Functional Requirements

The way a system satisfies the functional requirements is defined by its non-functional needs. To guarantee the quality, this prerequisite must be fulfilled.

2.3.1 Performance

- Response Time: The system should process and recognize faces within 2-3 seconds to ensure smooth user experience.
- Throughput: The system should be capable of processing a minimum of 100-200 users per hour, depending on the deployment scale.
- Real-time Operation: The system should operate in real time, with minimal latency between a person entering and the attendance being recorded.

2.3.2 Reliability

- Availability: The system should be available for use 24/7 with minimal downtime. The target uptime should be at least 99.9%.
- Fault Tolerance: The system should continue to operate even in the event of non-critical failures (e.g., database errors), and automatic recovery mechanisms should be in place.
- Data Integrity: The system should ensure that attendance data is accurate, and no records are lost or corrupted during transactions.

2.3.3 Usability

- Ease of Use: The system should have an intuitive user interface (UI) for both administrators and users. Attendance marking should be simple for users to interact with, requiring minimal instruction.
- User Training: The system should include user-friendly documentation and training materials for both administrators and end-users to ensure smooth implementation.
- Error Handling: Clear, understandable error messages should be displayed if the system fails to recognize a face or encounters any issues, guiding users on corrective actions.

2.3.4 Security

- Data Encryption: All biometric data (such as facial images) should be encrypted both during transmission and while stored.
- User Authentication: The system should include secure authentication mechanisms to prevent unauthorized access to the attendance data or facial recognition settings.
- Privacy Compliance: The system must comply with privacy regulations such as GDPR or CCPA, ensuring that users' personal data (including facial images) are handled and stored responsibly.
- Access Control: Only authorized personnel should have access to modify user data, manage settings, or access attendance logs

2.4 Object-oriented System design using UML

2.4.1 Use Case Diagram

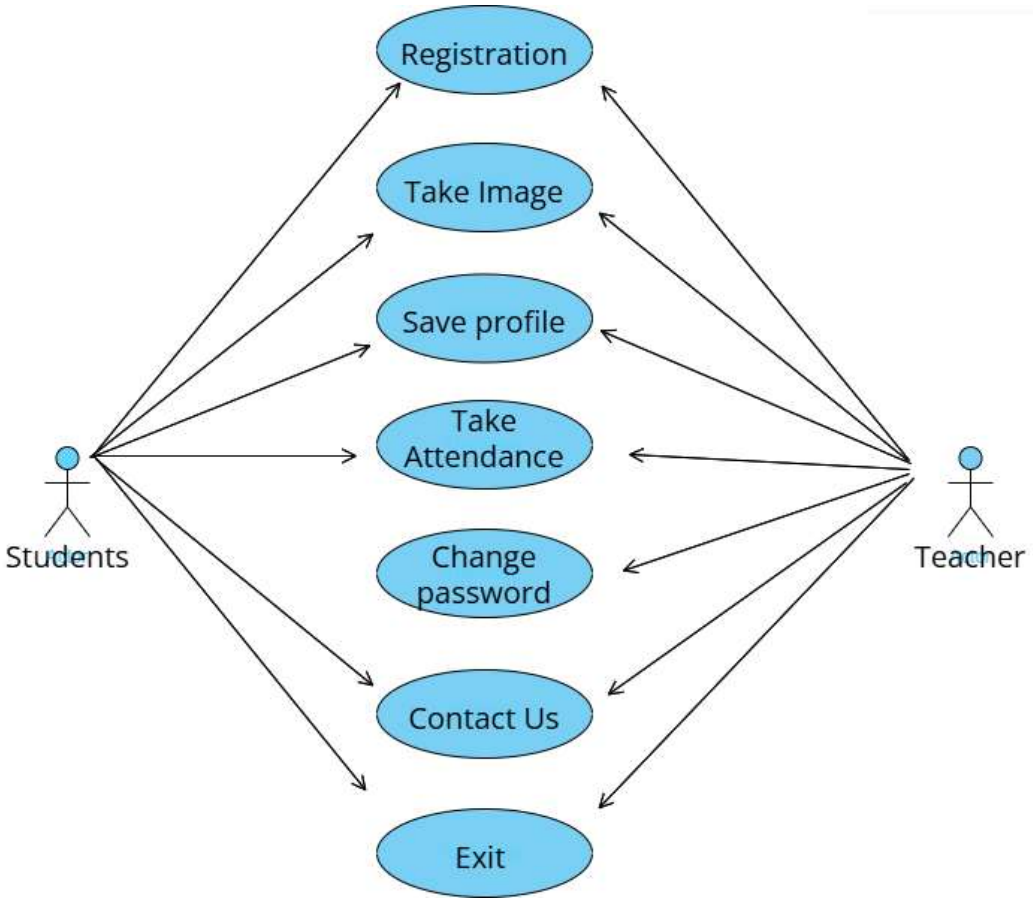

Figure 2.1: Use case Diagram

2.4.2 Case Description

Case Description-01: Registration

<table>
<tr><td>Use Case</td><td>Registration</td></tr>
<tr><td>Goal</td><td>Users can register to use the system.</td></tr>
<tr><td>Precondition</td><td>Users must install the Face Recognition app for registration.</td></tr>
<tr><td>Success End Condition</td><td>Notification: !!!Successfully Registered!!!</td></tr>
<tr><td>Failed End Condition</td><td>Notification: “Submission Not Submitted”</td></tr>
<tr><td>Primary Actors:
Secondary Actors:</td><td>Students and Teachers</td></tr>
<tr><td>Trigger</td><td>User will request to take images</td></tr>
<tr><td>Description / Main Success Scenario</td><td>
<table>
<tr><td>1.</td><td>Press “Registration” Button</td></tr>
<tr><td>2.</td><td>Provide ID and Name block</td></tr>
<tr><td>3.</td><td>Enter Information</td></tr>
<tr><td>4.</td><td>Press “Save Profile” Button.</td></tr>
<tr><td>5.</td><td>Information saved</td></tr>
<tr><td>6.</td><td>The system saves the details and shows them !!!
Successfully Registered!!! Notify</td></tr>
</table>
</td></tr>
<tr><td>Alternative Flows</td><td>
<table>
<tr><td>1.1</td><td>System Error</td></tr>
<tr><td></td><td>1.1.a. Try Again!!</td></tr>
<tr><td>4.1</td><td>The Blocks are empty!</td></tr>
<tr><td></td><td>4.1.a. Checked By the system & Notify by “Please! Fill Up the Box”.</td></tr>
<tr><td>5.1</td><td>The system did not respond</td></tr>
<tr><td></td><td>5.1.a. Show Error Message.</td></tr>
<tr><td>6.1</td><td>The system Doesn’t save the details.</td></tr>
<tr><td></td><td>6.1.a. Notification: “Profile did not Saved”</td></tr>
</table>
</td></tr>
</table>

Quality Requirements	The user Will fill up all the details according to the function

Case Description-02: Take Image

<table>
<tr><td>Use Case</td><td>Take Images</td></tr>
<tr><td>Goal</td><td>Users must take images to get registered</td></tr>
<tr><td>Precondition</td><td>Users must install the Face Recognition app for registration.</td></tr>
<tr><td>Success End Condition</td><td></td></tr>
<tr><td>Failed End Condition</td><td>Notification: “File Error”</td></tr>
<tr><td>Primary Actors:
Secondary Actors:</td><td>Students and Teachers</td></tr>
<tr><td>Trigger</td><td>User will then request to save profile</td></tr>
<tr><td>Description / Main Success Scenario</td><td>
<table>
<tr><td>1.</td><td>Press “Take Image” Button</td></tr>
<tr><td>2.</td><td>Web Camera will open</td></tr>
<tr><td>3.</td><td>Automatically take images</td></tr>
<tr><td>4.</td><td>After taking images, Web camera will be shut down</td></tr>
<tr><td>5.</td><td>Images saved</td></tr>
<tr><td>6.</td><td>The system saves the Images in the Folder name Student Details</td></tr>
</table>
</td></tr>
<tr><td>Alternative Flows</td><td>
<table>
<tr><td>1.1</td><td>System Error</td></tr>
<tr><td></td><td>1.1.a. Try Again!!</td></tr>
<tr><td>2.1</td><td>Web Camera could not be found</td></tr>
<tr><td></td><td>2.1.a. Checked By the system & Notify by “Not Found”</td></tr>
</table>
</td></tr>
<tr><td>Quality Requirements</td><td>The user should be in bright light areas.</td></tr>
</table>

Case Description-03: Save Profile

<table>
<tr><td>Use Case</td><td>Save Profile</td></tr>
<tr><td>Goal</td><td>Users have to save their profile to use the system.</td></tr>
<tr><td>Precondition</td><td>Users must take Images to save their profile</td></tr>
<tr><td>Success End Condition</td><td>Notification: !!!Profile Saved Successfully!!!</td></tr>
<tr><td>Failed End Condition</td><td>Notification: “Profile Not Saved”</td></tr>
<tr><td>Primary Actors:
Secondary Actors:</td><td>Students and Teachers</td></tr>
<tr><td>Trigger</td><td>User then can take attendance</td></tr>
<tr><td>Description / Main Success Scenario</td><td><table>
<tr><td>1.</td><td>Press “Save profile” Button</td></tr>
<tr><td>2.</td><td>Enter the password</td></tr>
<tr><td>3.</td><td>Profile will be saved</td></tr>
<tr><td>2.</td><td>Profile will be saved The system saves the details and shows them !!!
Profile Saved Successfully !!! Notify</td></tr>
</table></td></tr>
<tr><td>Alternative Flows</td><td><table>
<tr><td>1.1</td><td>System Error</td></tr>
<tr><td></td><td>1.1.a. Try Again!!</td></tr>
</table></td></tr>
<tr><td>Quality Requirements</td><td>The user should have enough space in the device</td></tr>
</table>

Case Description-04: Take Attendance

<table>
<tr><td>Use Case</td><td>Take Attendance</td></tr>
<tr><td>Goal</td><td>Users will take Attendance</td></tr>
<tr><td>Precondition</td><td>Users must Registered them.</td></tr>
<tr><td>Success End Condition</td><td>List of Attendance will be shown</td></tr>
<tr><td>Failed End Condition</td><td></td></tr>
<tr><td>Primary Actors:
Secondary Actors:</td><td>Students and Teachers</td></tr>
<tr><td>Trigger</td><td>User will request to End the session</td></tr>
<tr><td>Description / Main Success Scenario</td><td><table>
<tr><td>1.</td><td>Press “Take Attendance” Button</td></tr>
<tr><td>2.</td><td>Web Cam will be ON</td></tr>
<tr><td>3.</td><td>The System will Recognize the user</td></tr>
<tr><td>4.</td><td>Press Q to End the session</td></tr>
<tr><td>5.</td><td>List of Attendance will be shown</td></tr>
</table></td></tr>
<tr><td>Alternative Flows</td><td><table>
<tr><td>1.1</td><td>System Error</td></tr>
<tr><td></td><td>1.1.a. Try Again!!</td></tr>
<tr><td>3.1</td><td>The user do not recognized !</td></tr>
<tr><td></td><td>3.1.a. Checked By the system & Notify by “Unknown”.</td></tr>
</table></td></tr>
<tr><td>Quality Requirements</td><td>The user should be in bright light areas.</td></tr>
</table>

Case Description-05: Change Password

<table>
<tr><td>Use Case</td><td>Change Password</td></tr>
<tr><td>Goal</td><td>Users can change password as they want.</td></tr>
<tr><td>Precondition</td><td>Users must know the Old password.</td></tr>
<tr><td>Success End Condition</td><td>Notification: !!!Password Changed Successfully!!!</td></tr>
<tr><td>Failed End Condition</td><td>Notification: !!!Please Enter Old Password Correctly!!!</td></tr>
<tr><td>Primary Actors:
Secondary Actors:</td><td>Teachers</td></tr>
<tr><td>Trigger</td><td>User will request a new password.</td></tr>
<tr><td>Description / Main Success Scenario</td><td>
<table>
<tr><td>1.</td><td>Press “Change Password” Button</td></tr>
<tr><td>2.</td><td>Enter Old password</td></tr>
<tr><td>3.</td><td>Enter New password</td></tr>
<tr><td>4.</td><td>Confirm New password</td></tr>
<tr><td>5.</td><td>Information saved</td></tr>
<tr><td>6.</td><td>The system saves the details and shows them !!!
Password Changed Successfully!!! Notify</td></tr>
</table>
</td></tr>
<tr><td>Alternative Flows</td><td>
<table>
<tr><td>1.1</td><td>System Error</td></tr>
<tr><td></td><td>1.1.a. Try Again!!</td></tr>
<tr><td>4.1</td><td>The user Did not fill up the details correctly!</td></tr>
<tr><td></td><td>4.1.a. Checked By the system & Notify by “Please Enter Old Password Correctly”.</td></tr>
</table>
</td></tr>
<tr><td>Quality Requirements</td><td>The user should know the Old password.</td></tr>
</table>

Case Description-06: Contact Us

<table>
<tr><td>Use Case</td><td>Contact Us</td></tr>
<tr><td>Goal</td><td>Users can contact with the developer.</td></tr>
<tr><td>Precondition</td><td></td></tr>
<tr><td>Success End Condition</td><td>Notification: !!! Please contact us on : ‘shadab35-2884@diu.edu.bd’!!!</td></tr>
<tr><td>Failed End Condition</td><td></td></tr>
<tr><td>Primary Actors:
Secondary Actors:</td><td>Students and Teachers</td></tr>
<tr><td>Trigger</td><td></td></tr>
<tr><td>Description / Main Success Scenario</td><td><table><tr><td>1.</td><td>Press “Contact Us” Button</td></tr><tr><td>2.</td><td>Provide an email address</td></tr></table></td></tr>
<tr><td>Alternative Flows</td><td><table><tr><td>1.1</td><td>Contact button do not response</td></tr><tr><td></td><td>1.1.a. Checked By the system & Notify by “Try Later”.</td></tr></table></td></tr>
<tr><td>Quality Requirements</td><td>The user should have an email address.</td></tr>
</table>

Case Description-07: Exit

<table>
<tr><td>Use Case</td><td>Exit</td></tr>
<tr><td>Goal</td><td>To End the session.</td></tr>
<tr><td>Precondition</td><td></td></tr>
<tr><td>Success End Condition</td><td></td></tr>
<tr><td>Failed End Condition</td><td></td></tr>
<tr><td>Primary Actors:
Secondary Actors:</td><td>Students and Teachers</td></tr>
<tr><td>Trigger</td><td></td></tr>
<tr><td>Description / Main Success Scenario</td><td><table><tr><td>1.</td><td>Press “Help” Button</td></tr><tr><td>2.</td><td>Provide an “Exit” Button</td></tr><tr><td>3.</td><td>Click on “Exit” Button</td></tr></table></td></tr>
<tr><td>Alternative Flows</td><td><table><tr><td>3.1</td><td>Exit button do not response</td></tr><tr><td></td><td>3.1.a. Click “Quit” button.</td></tr></table></td></tr>
<tr><td>Quality Requirements</td><td>The user must decide when to exit One session.</td></tr>
</table>

2.4.3 Activity Diagram

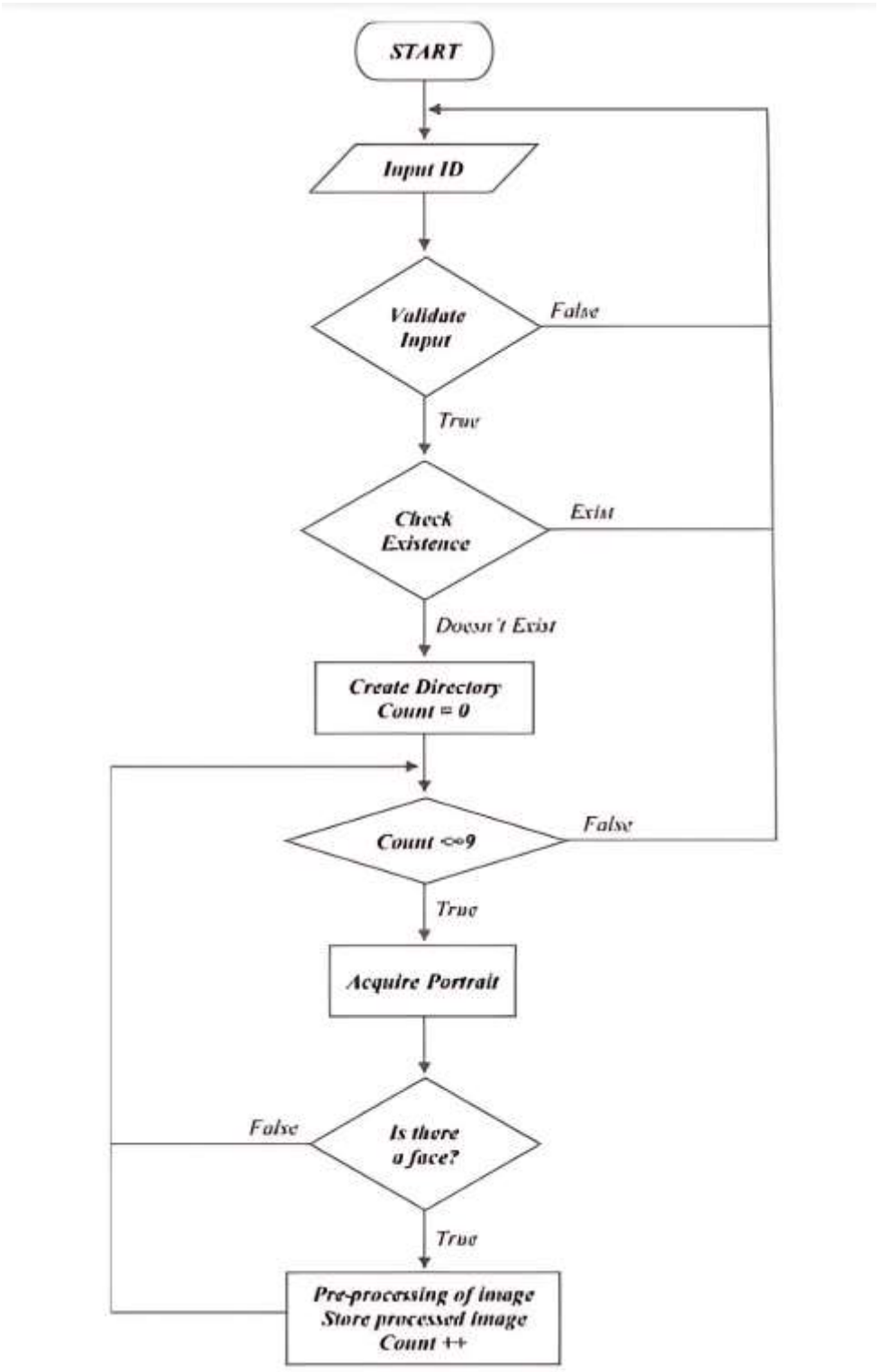

Figure 2.2: Registration

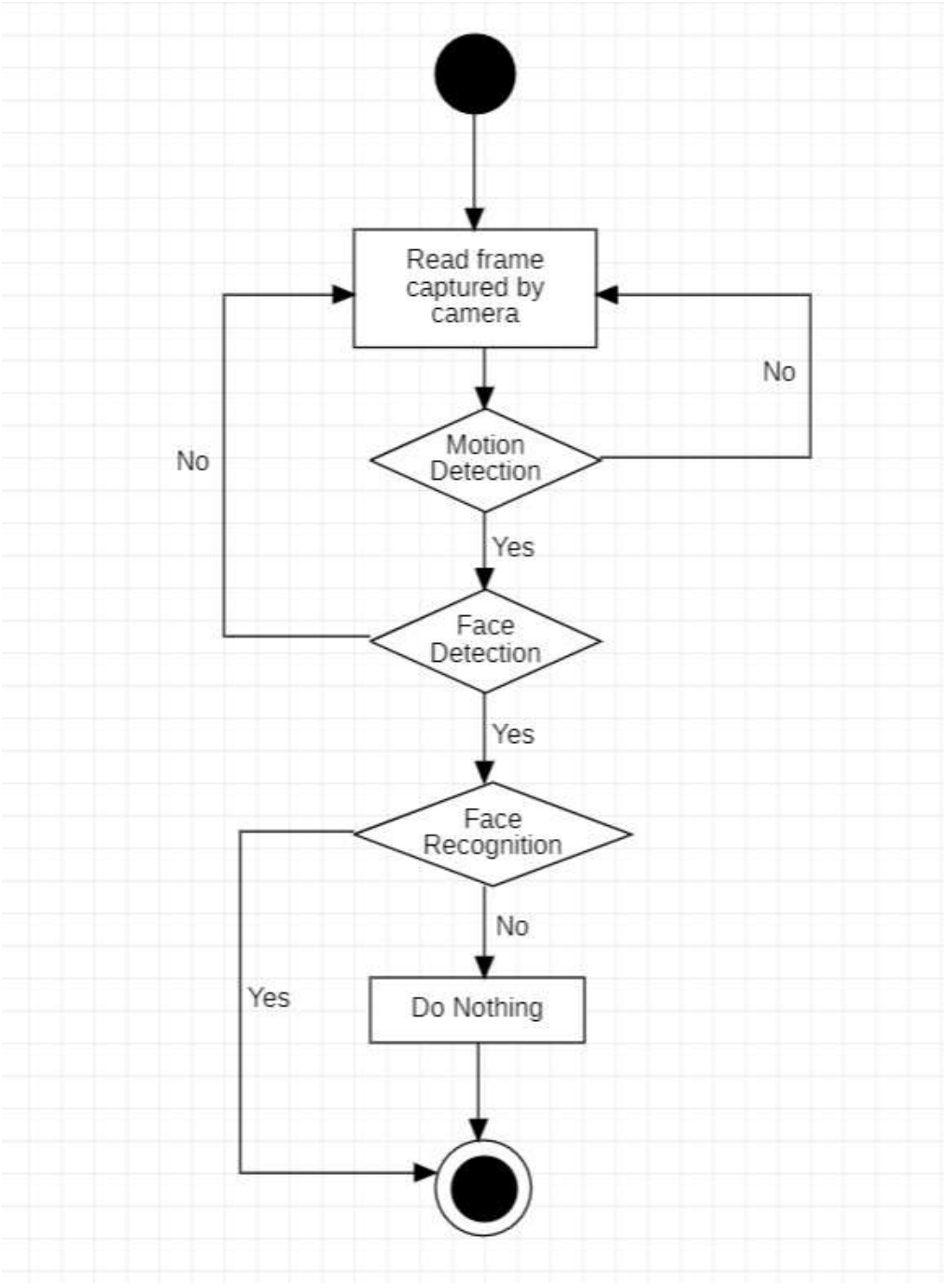

Figure 2.3: Take Attendance

2.4.4 Sequence Diagram

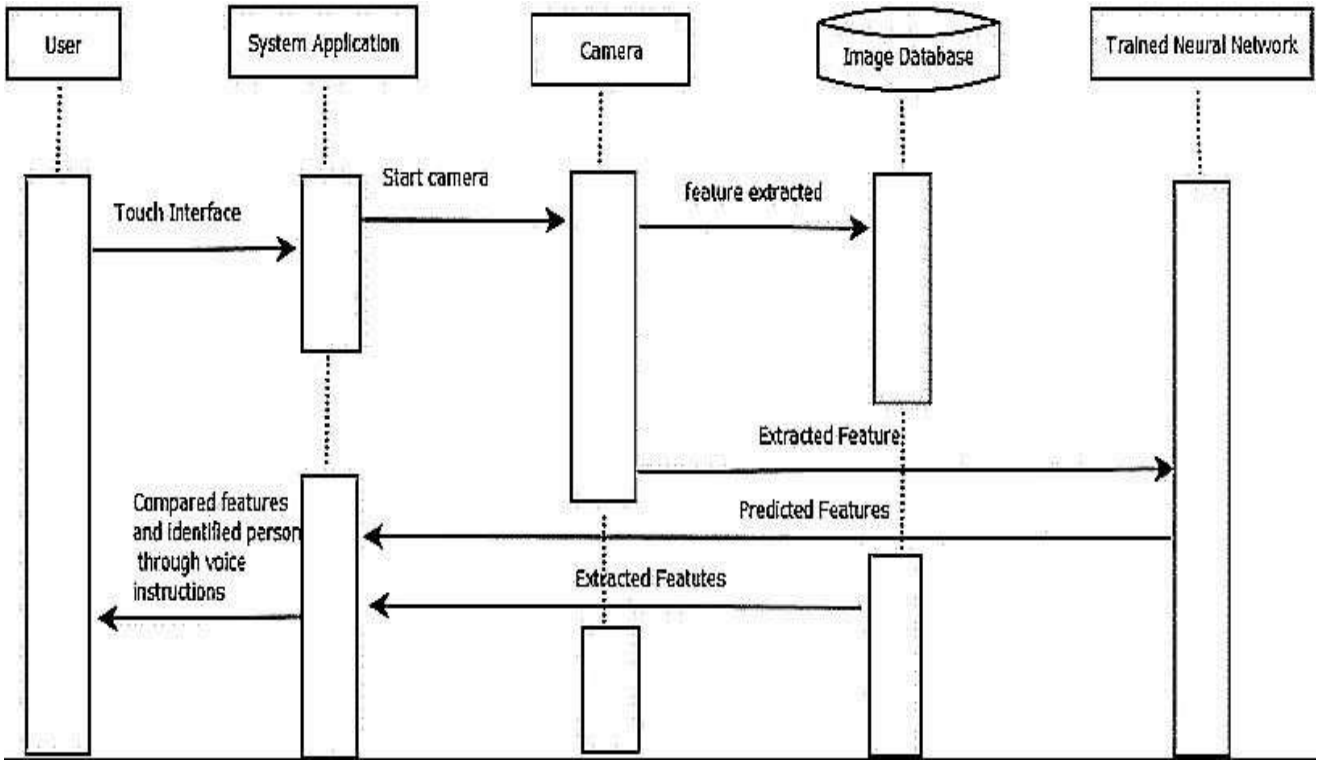

Figure 2.4: Take Attendance

2.4.5 Class Diagram

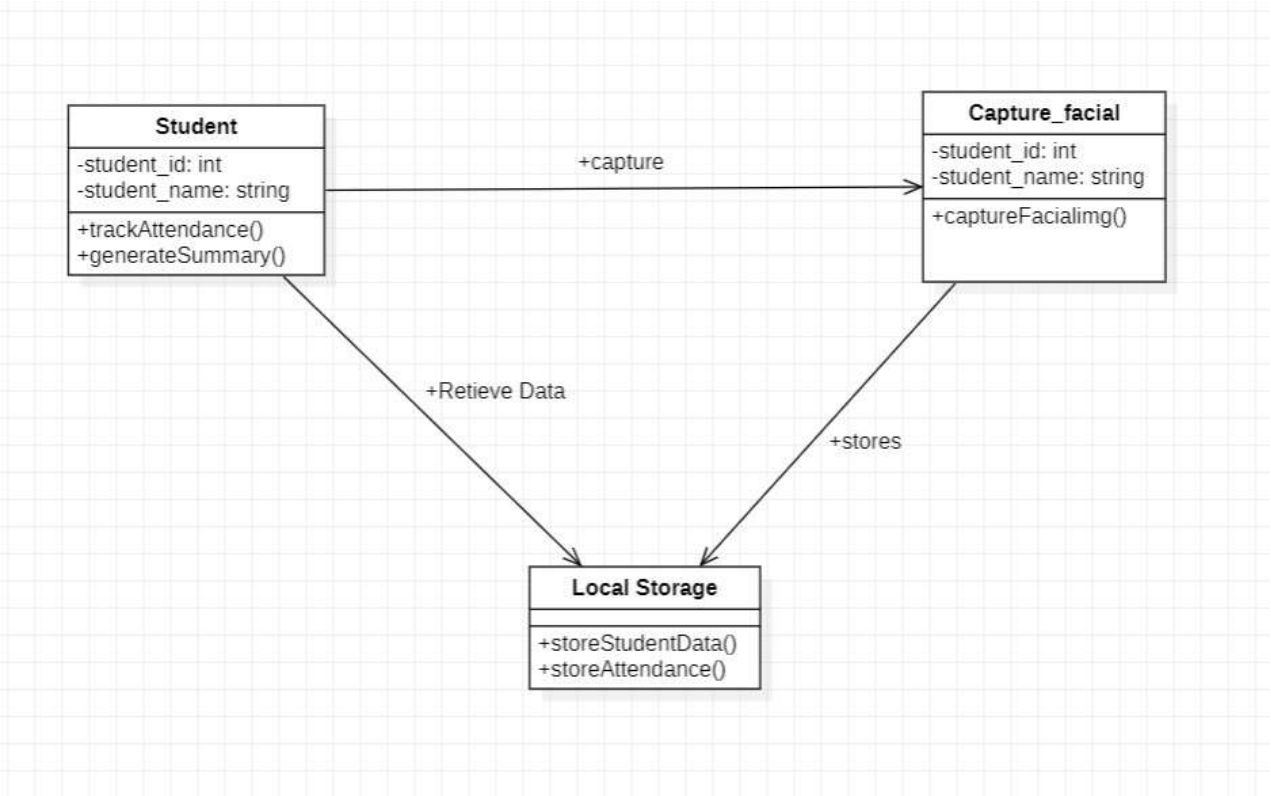

Figure 2.5: Class Diagram

2.4.6 ER Diagram

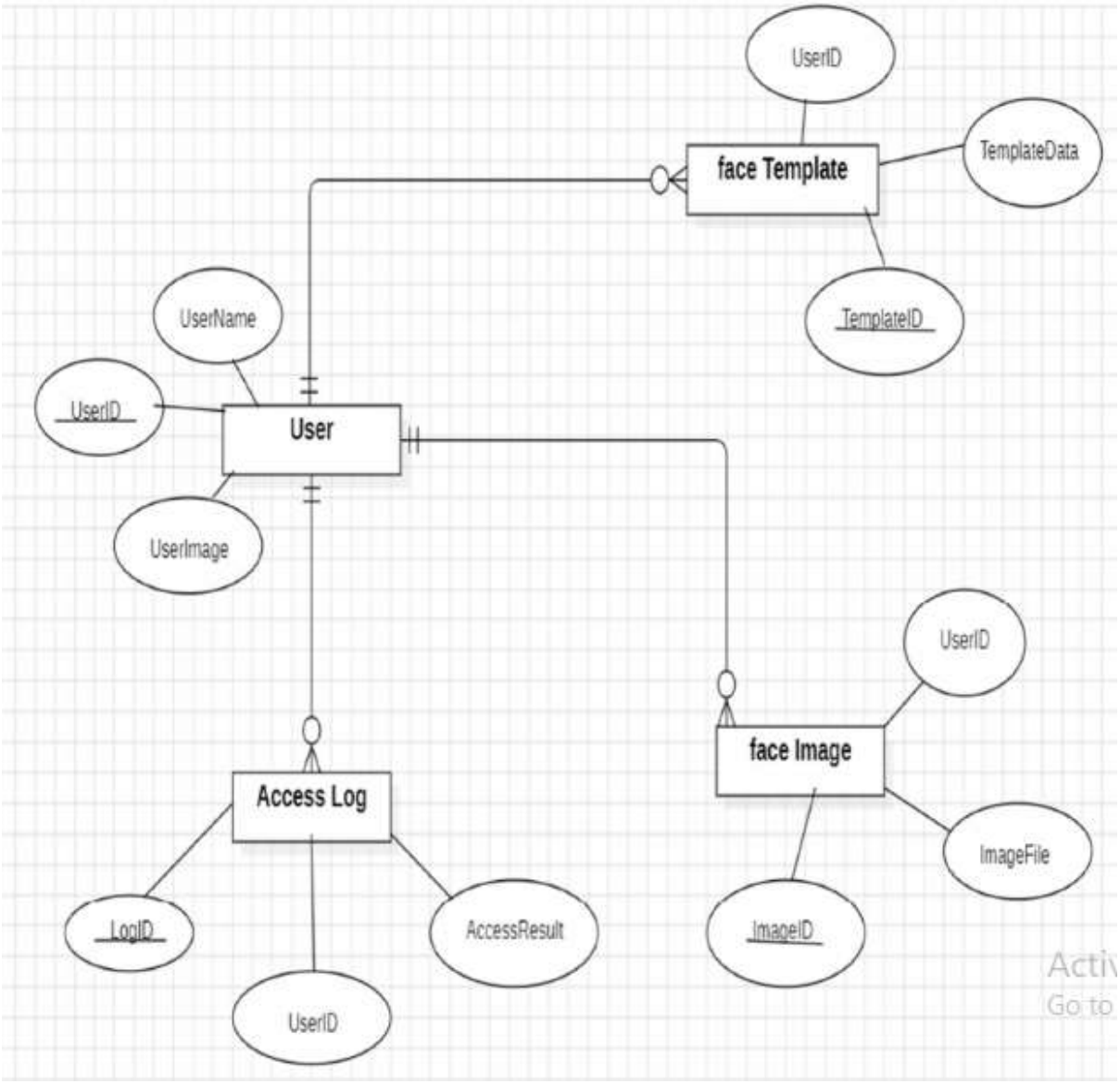

Figure 2.6: ER Diagram

2.5 Coding: Appendix A

```
import tkinter as tk
from tkinter import ttk
from tkinter import messagebox as mess
import tkinter.simpledialog as tsd
import cv2,os
import csv
import numpy as np
from PIL import Image
import pandas as pd
import datetime
import time

########################################## FUNCTIONS ###########################################

def assure_path_exists(path):
    dir = os.path.dirname(path)
    if not os.path.exists(dir):
        os.makedirs(dir)

################################################################################################

def tick():
    time_string = time.strftime('%H:%M:%S')
    clock.config(text=time_string)
    clock.after(200,tick)

################################################################################################

def contact():
    mess._show(title='Contact us', message="Please contact us on : 'shadab35-2884@diu.edu.bd' ")

################################################################################################

def check_haarcascadefile():
    exists = os.path.isfile("haarcascade_frontalface_default.xml")
    if exists:
        pass
    else:
        mess._show(title='Some file missing', message='Please contact us for help')
        window.destroy()

################################################################################################

def TrainImages():
    check_haarcascadefile()
    assure_path_exists("TrainingImageLabel/")
    recognizer = cv2.face_LBPHFaceRecognizer.create()
    harcascadePath = "haarcascade_frontalface_default.xml"
    detector = cv2.CascadeClassifier(harcascadePath)
    faces, ID = getImagesAndLabels("TrainingImage")
    try:
        recognizer.train(faces, np.array(ID))
    except:
        mess._show(title='No Registrations', message='Please Register someone fi
        return
    recognizer.save("TrainingImageLabel\Trainner.yml")
    res = "Profile Saved Successfully"
    messagel.configure(text=res)
    message.configure(text='Total Registrations till now  : ' + str(ID[0]))
```

```
global key
key = ''

ts = time.time()
date = datetime.datetime.fromtimestamp(ts).strftime(' %d-%m-%Y ')
day,month,year=date.split("-")

mont={'01':'January',
      '02':'February',
      '03':'March',
      '04':'April',
      '05':'May',
      '06':'June',
      '07':'July',
      '08':'August',
      '09':'September',
      '10':'October',
      '11':'November',
      '12':'December'
      }

######################################## CUT FRONT END ##############

window = tk.Tk()
window.geometry("1280x720")
window.resizable(True,False)
window.title("Attendance System")
window.configure(background='#2d420a')

frame1 = tk.Frame(window, bg="#c79cff")
frame1.place(relx=0.11, rely=0.17, relwidth=0.39, relheight=0.80)

frame2 = tk.Frame(window, bg="#c79cff")
frame2.place(relx=0.51, rely=0.17, relwidth=0.38, relheight=0.80)

message3 = tk.Label(window, text="Face Recognition Based Attendance Monitoring S
message3.place(x=10, y=10)

frame3 = tk.Frame(window, bg="#c4c6ce")
frame3.place(relx=0.52, rely=0.09, relwidth=0.09, relheight=0.07)

frame4 = tk.Frame(window, bg="#c4c6ce")
frame4.place(relx=0.36, rely=0.09, relwidth=0.16, relheight=0.07)

datef = tk.Label(frame4, text = day+"-"+mont[month]+"-"+year+"  |  ", fg="#ff61e
datef.pack(fill='both',expand=1)

clock = tk.Label(frame3,fg="#ff61e5",bg="#2d420a" ,width=55 ,height=1,font=('cor
clock.pack(fill='both',expand=1)
tick()

head2 = tk.Label(frame2, text="                       For New Registrations
head2.grid(row=0,column=0)

head1 = tk.Label(frame1, text="                       For Already Registered
head1.place(x=0,y=0)
```

```
lbl = tk.Label(frame2, text="Enter ID",width=20  ,height=1  ,fg="black"  ,bg="
lbl.place(x=80, y=55)

txt = tk.Entry(frame2,width=32 ,fg="black",font=('comic', 15, ' bold '))
txt.place(x=30, y=88)

lbl2 = tk.Label(frame2, text="Enter Name",width=20  ,fg="black"  ,bg="#c79cff"
lbl2.place(x=80, y=140)

txt2 = tk.Entry(frame2,width=32 ,fg="black",font=('comic', 15, ' bold ')  )
txt2.place(x=30, y=173)

messagel = tk.Label(frame2, text="1)Take Images  >>>  2)Save Profile" ,bg="#c7
messagel.place(x=7, y=230)

message = tk.Label(frame2, text="" ,bg="#c79cff" ,fg="black"  ,width=39,height
message.place(x=7, y=450)

lbl3 = tk.Label(frame1, text="Attendance",width=20  ,fg="black"  ,bg="#c79cff"
lbl3.place(x=100, y=115)

res=0
exists = os.path.isfile("StudentDetails\StudentDetails.csv")
if exists:
    with open("StudentDetails\StudentDetails.csv", 'r') as csvFile1:
        reader1 = csv.reader(csvFile1)
        for l in reader1:
            res = res + 1
    res = (res // 2) - 1
    csvFile1.close()
else:
    res = 0
message.configure(text='Total Registrations till now  : '+str(res))
```

2.6 Summary

The design and implementation chapter of the Face Recognition Attendance System details the entire process from planning and designing the architecture to implementing and testing the system. The successful deployment of the system provides an automated and efficient way to track attendance using facial recognition technology, offering a more streamlined and secure alternative to traditional attendance methods.

Chapter 3 Software Testing

3.1 Introduction

Features are tested in order to determine which user experience works best. Feature testing allows us to ascertain which iteration of a feature will be more successful while also verifying whether a new feature is a good fit for the website or application. It aids in the development of a dependable, effective, efficient, practical, and safe application.

3.2 Testing Features

3.2.1 Feature to Be Tested

a. Registration
b. Take Images
c. Take Attendance
d. Change Password
e. Contact Us
f. Exit

3.3 Testing Strategies

3.3.1 Test Approach

• Two distinct types of testing have been employed to guarantee the system's quality. It primarily focuses on White Box and Black Box testing.

• Black Box Testing: This type of testing concentrates solely on the results. There are some outputs that are produced for a given input. These results are then compared to the anticipated result. The function is accepted if they match.

• White Box Testing: Structural testing is also known as white box testing. The system's internal mechanism is taken into account in this testing technique.

3.3.2 Pass/Fail Criteria

To ensure the accuracy, reliability, and functionality of the Face Recognition Attendance System, the following pass/fail criteria will be applied during testing:

1. Accuracy of Face Recognition

Pass Criteria:

- The system should successfully recognize a registered user's face with an accuracy rate of 95% or higher.
- The system must correctly match the user's face from a variety of angles and facial expressions under different lighting conditions.
- The system should work efficiently even if the user's face is partially obscured (e.g., glasses, masks, or hats).

Fail Criteria:

- The system fails to recognize a registered user more than 5% of the time.
- Face recognition accuracy is below 95%.
- The system fails to identify users under different lighting conditions or angles (e.g., strong backlighting or poor visibility).

2. Attendance Recording Functionality

Pass Criteria:

- The system should automatically mark attendance when a recognized face is detected.
- The system should record the correct timestamp and user details in the attendance database.
- The attendance is correctly stored without errors (i.e., no duplication or incorrect entries).

Fail Criteria:

- Attendance is not marked when a recognized user is in front of the system.
- The system records incorrect or duplicate attendance entries.
- The timestamp or user details are incorrectly recorded.

3. Performance and Response Time

Pass Criteria:

- The system should process and identify a face within 3 seconds under normal operating conditions.

Fail Criteria:

- The face recognition process takes longer than 5 seconds.
- The system crashes or significantly lags when handling multiple users.

3.4 System Testing (Test Cases with Report)

Test case 01: Registration

Test Case: 3.4.1			**Test Case Name:** Registration			
System: FaceAtt			**Subsystem:** User Authentication			
Designed by: Shadab Pervaz Vikki			**Design Date:** 29-Nov-2024			
Executed by: Shadab Pervaz Vikki			**Execution Date:** 16-Dec_2024			
	Description: The user registers for FaceAtt system by providing valid registration information.					
	Pre-condition: The user need to access the Dashboard.					
Step	**ID**	**Name**	**Take Image**	**Response**	**Pass/Fail**	**Comment**
1	123	Vikki	Yes	Profile Saved Successfully	Pass	The user successfully registered thyself.
2		vikki	Yes	ID field empty	Fail	The user needs to input ID.
3	123		Yes	Enter Correct Name	Fail	The user needs to input Name.
4	123	vikki	No	Could not save profile	Fail	The User need to take Images.
Post-condition: The User is successfully registered with valid information.						

Table 3.1: Registration

Test case 02: Take Images

Test Case: 3.4.2			**Test Case Name:** Take Images			
System: FaceAtt			**Subsystem:** User Authentication			
Designed by: Shadab Pervaz Vikki			**Design Date:** 29-Nov-2024			
Executed by: Shadab Pervaz Vikki			**Execution Date:** 16-Dec_2024			
	Description: The user registers for FaceAtt system by providing Face Images.					
	Pre-condition: The user need to Input ID and Name.					
Step	**ID**	**Name**	**Take Image**	**Response**	**Pass/Fail**	**Comment**
1	123	Vikki	Yes	Profile Saved Successfully	Pass	The user successfully registered thyself.
2	123	vikki	no	Profile Could Not Be Saved	Fail	The user needs to Take Images.
Post-condition: The User is successfully registered with Training Images that could be used for taking attendance.						

Table 3.2: Take Images

Test case 03: Take Attendance

Test Case: 3.4.3			**Test Case Name:** Take Attendance		
System: FaceAtt			**Subsystem:** User Attendance		
Designed by: Shadab Pervaz Vikki			**Design Date:** 30-Nov-2024		
Executed by: Shadab Pervaz Vikki			**Execution Date:** 16-Dec_2024		
	Description: The user record attendance.				
	Pre-condition: The user must be a Registered User.				
Step	**User**	**Attendance**	**Response**	**Pass/Fail**	**Comment**
1	Known	Recorded	Showing Attendance.	Pass	The User's attendance showing on the Dashboard and in the Attendance Excel Sheet.
2	Unknown	Not recorded	Waiting for the User to be known.	Fail	The System must recognize user before attendance is recorded.
Post-condition: The Attendance is taken and can be access through Attendance Excel Sheet.					

Table 3.3: Take Attendance

Test case 04: Change Password

Test Case: 3.4.4			**Test Case Name:** Change Password			
System: FaceAtt			**Subsystem:** Users Password			
Designed by: Shadab Pervaz Vikki			**Design Date:** 30-Nov-2024			
Executed by: Shadab Pervaz Vikki			**Execution Date:** 16-Dec_2024			
	Description: The users changes default password for their uses.					
	Pre-condition: The users must know the Old Password.					
Step	**Old Password**	**New Password**	**Confirm New Pass**	**Response**	**Pass/Fail**	**Comment**
1	ABC	DEF	DEF	Password Changed Successfully	Pass	The user successfully Changed Password.
2		DEF	DEF	Please Enter Correct Old Password	Fail	The user needs to input Old Password.
3	ABC		DEF	Confirm New Password Again.	Fail	The user needs to input New Password.
4	ABC	DEF		Confirm New Password Again.	Fail	The User need to confirm new password.
Post-condition: The Password has been changed for saving new profile.						

Table 3.4: Change Password

Test case 05: Contact Us

Test Case: 3.4.5			**Test Case Name:** Contact Us		
System: FaceAtt			**Subsystem:** Help		
Designed by: Shadab Pervaz Vikki			**Design Date:** 30-Nov-2024		
Executed by: Shadab Pervaz Vikki			**Execution Date:** 16-Dec_2024		
	Description: If the users need any help regarding the Face Recognition Attendance System, they can communicate with the Developer.				
	Pre-condition: Click “Help” button.				
Step	**Help Button**	**Contact Us**	**Response**	**Pass/Fail**	**Comment**
1	Clicked	Showing	Showing an Email Address	Pass	The user can now communicate with the given Email address.
2	Not Clicked	Not Showing	Empty	Fail	The user needs to click both “Help” and then “Contact Us” button.
Post-condition: The user can send Mails for Help.					

Table 3.5: Contact Us

Test case 06: Exit

Test Case: 3.4.6			**Test Case Name:** Exit		
System: FaceAtt			**Subsystem:** Termination		
Designed by: Shadab Pervaz Vikki			**Design Date:** 1-Dec-2024		
Executed by: Shadab Pervaz Vikki			**Execution Date:** 16-Dec_2024		
	Description: The user needs to close the system.				
	Pre-condition: Click “Help” button.				
Step	**Help Button**	**Exit**	**Response**	**Pass/Fail**	**Comment**
1	Clicked	Clicked	System Closed	Pass	The user Terminates the system.
2	Not Clicked	Not Showing	Empty	Fail	The user needs to click both “Help” and then “Exit” button.
Post-condition: The user ended the session.					

Table 3.6: Exit

3.5 Summary

In the chapter on Software Testing for a Face Recognition Attendance System, I explored various testing methods like unit testing, where individual Functions are checked, and integration testing, which ensures the system modules interact correctly. I also focused on testing the face recognition algorithm for accuracy, verifying if it correctly identifies faces under different conditions. Overall, I understood that rigorous testing is essential to guarantee the system's reliability, security, and user-friendliness before deployment.

Chapter 4 Deployment and Maintenance

4.1 Introduction

Deployment involves installing the face recognition attendance system on the designated hardware and integrating it with existing infrastructure (e.g., school or university databases). This process includes setting up cameras, servers, and user interfaces, as well as ensuring smooth communication between the system's software and database. Once deployed, the system undergoes testing to verify accuracy, functionality, and reliability in real-world conditions.

Maintenance ensures the system continues to operate effectively over time. Security patches are applied, and troubleshooting is performed to address any technical issues, ensuring the system's accuracy, efficiency, and security.

4.2 Try to follow the SRLC (software release life cycle)

Models of the Software Development Life Cycle (SDLC) illustrate the software development process. The quality, budget, schedule, and capacity of a project to satisfy the expectations of its stakeholders. Our approach to project development is based on the iterative enhancement concept. The flaw in the Waterfall paradigm is eliminated by this paradigm.

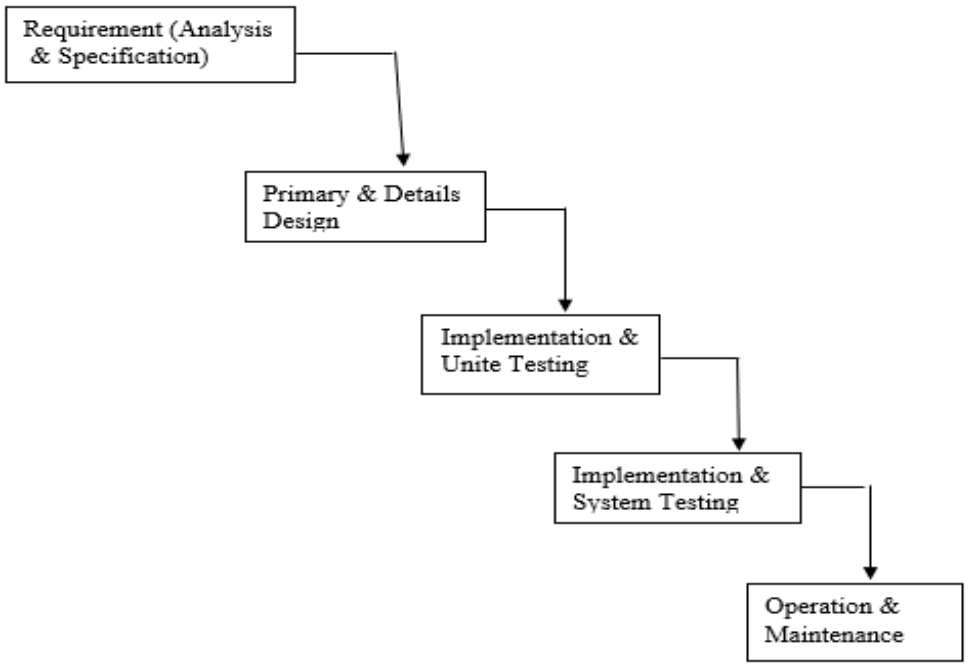

Figure 4: SDLC

Chapter 5 User Manual

5.1 Introduction

User Manual provides step-by-step instructions on how to use the system for efficient and accurate attendance tracking. It guides users through the setup process, including camera calibration and user registration, where individuals' facial data are stored securely. The manual explains how to mark attendance by simply facing the camera, with the system automatically identifying and recording the user. And checking the Attendance and Registration sheets.

5.2 Project Functionalities

Dashboard

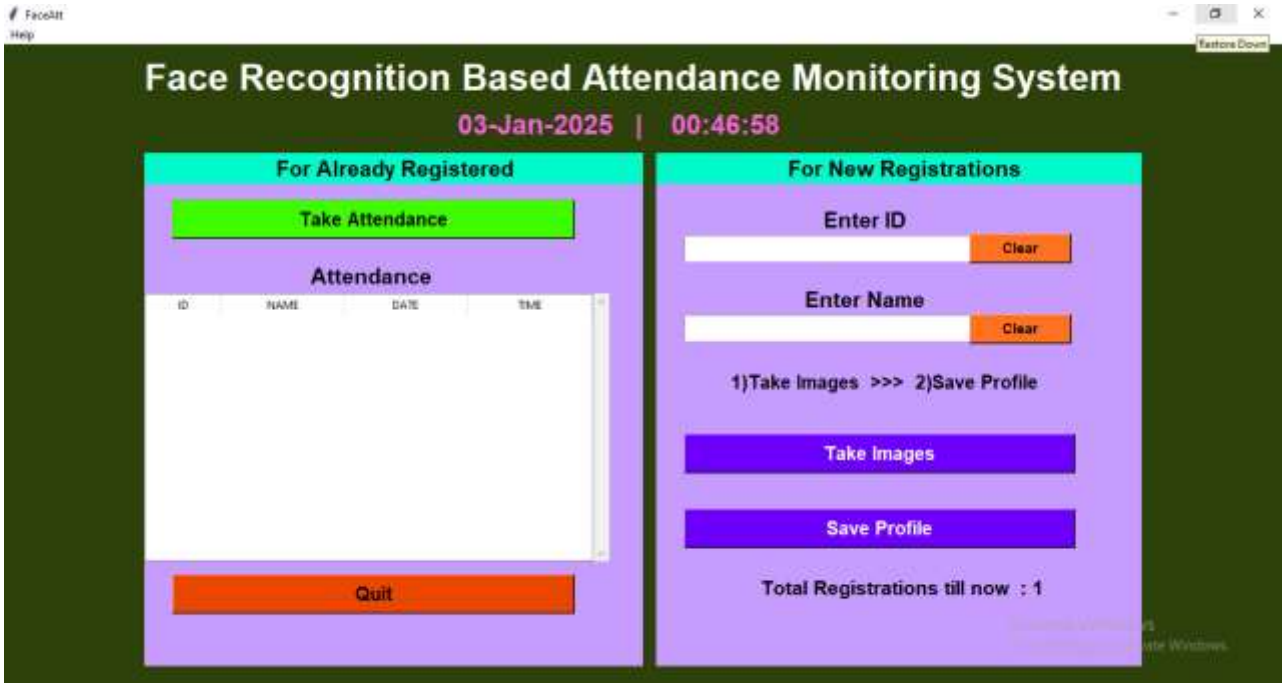

Figure 5.1: Dashboard

Registration and Take Images

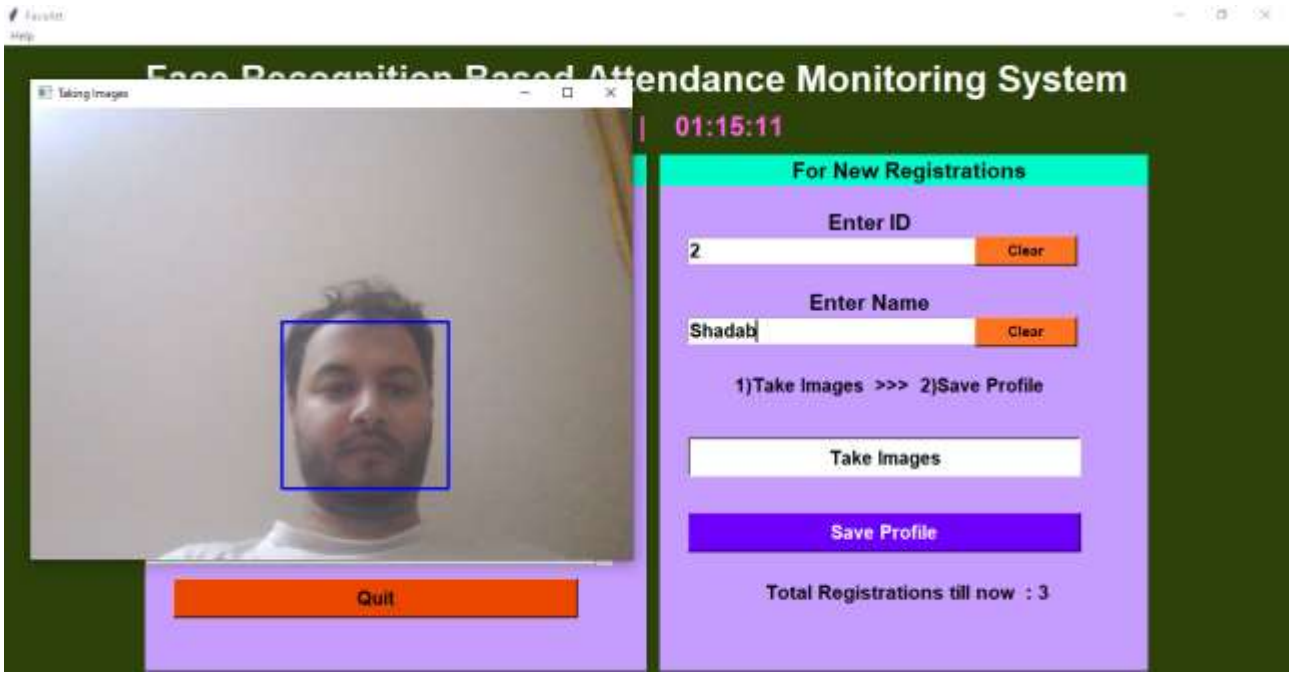

Figure 5.2: Registration and Take Image

Students Details

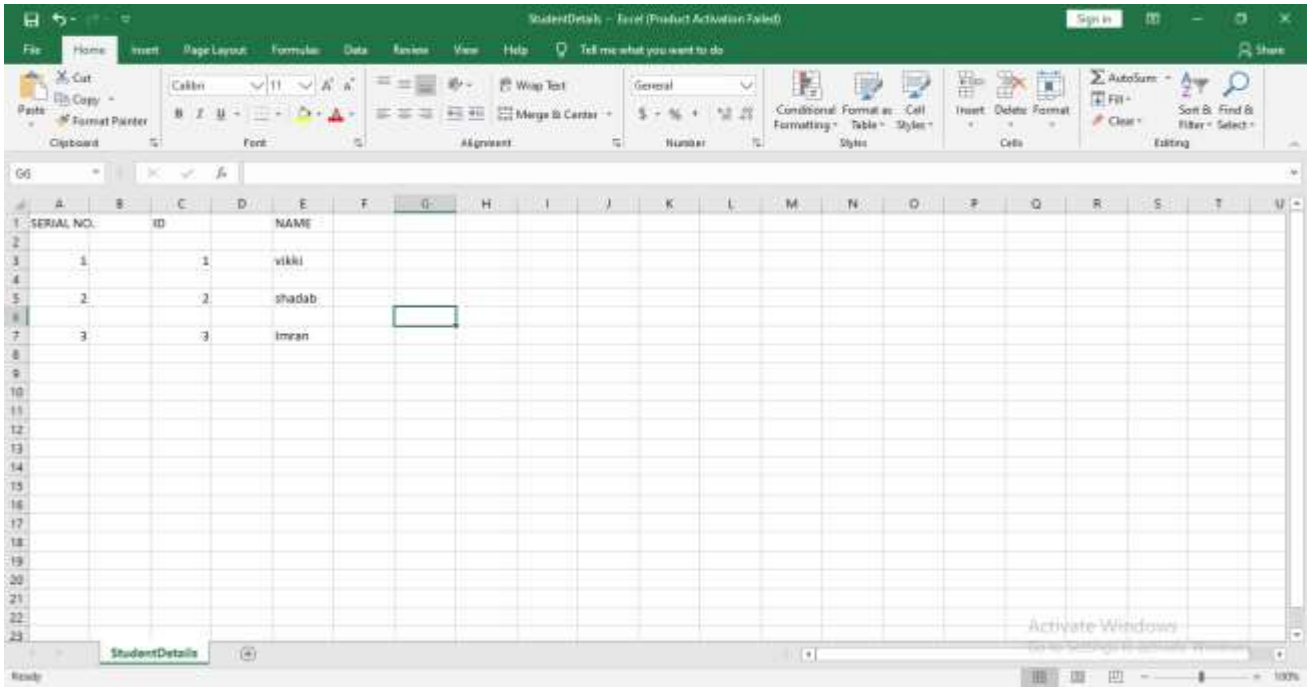

Figure 5.3: Students Details

Take Attendance

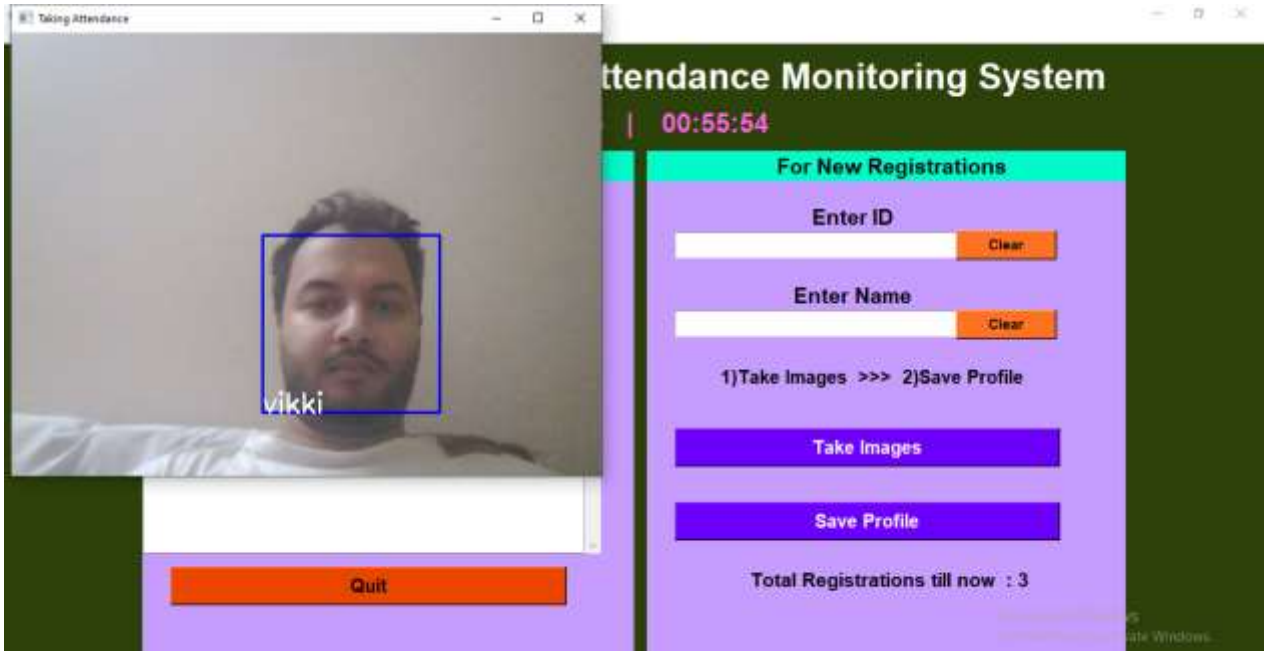

Figure 5.4: Take Attendance

Attendance Details

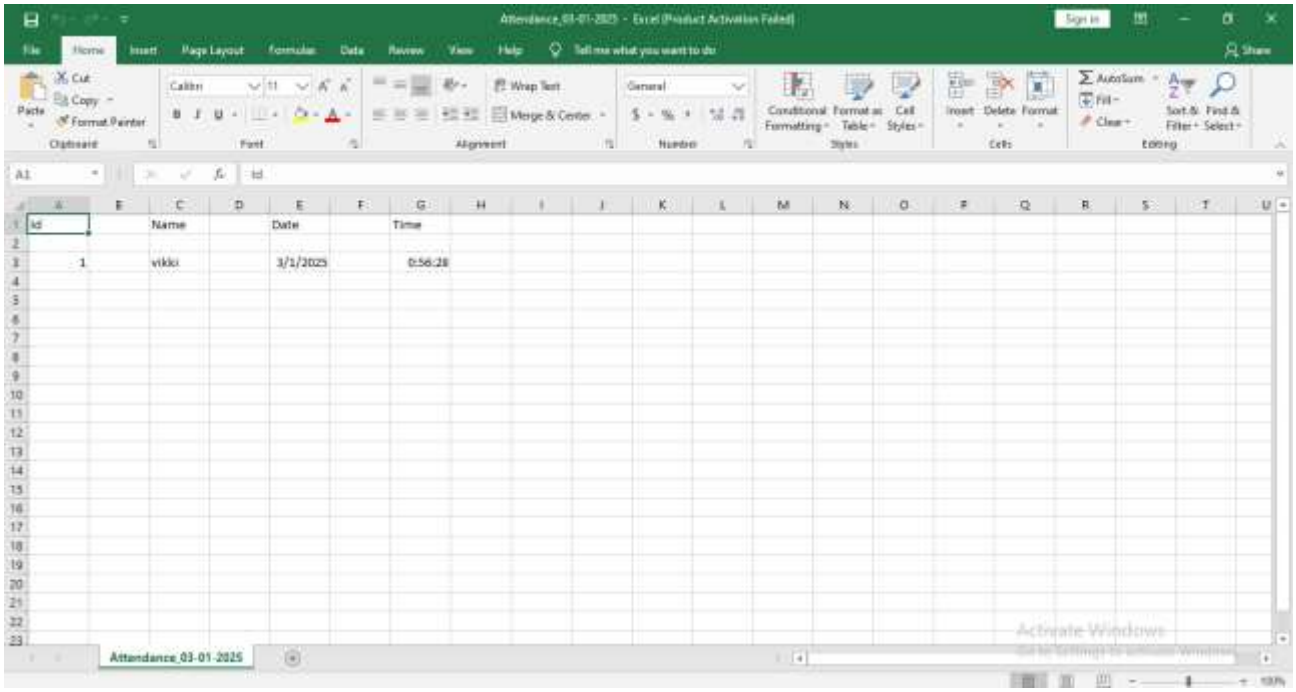

Figure 5.5: Attendance Details

Help

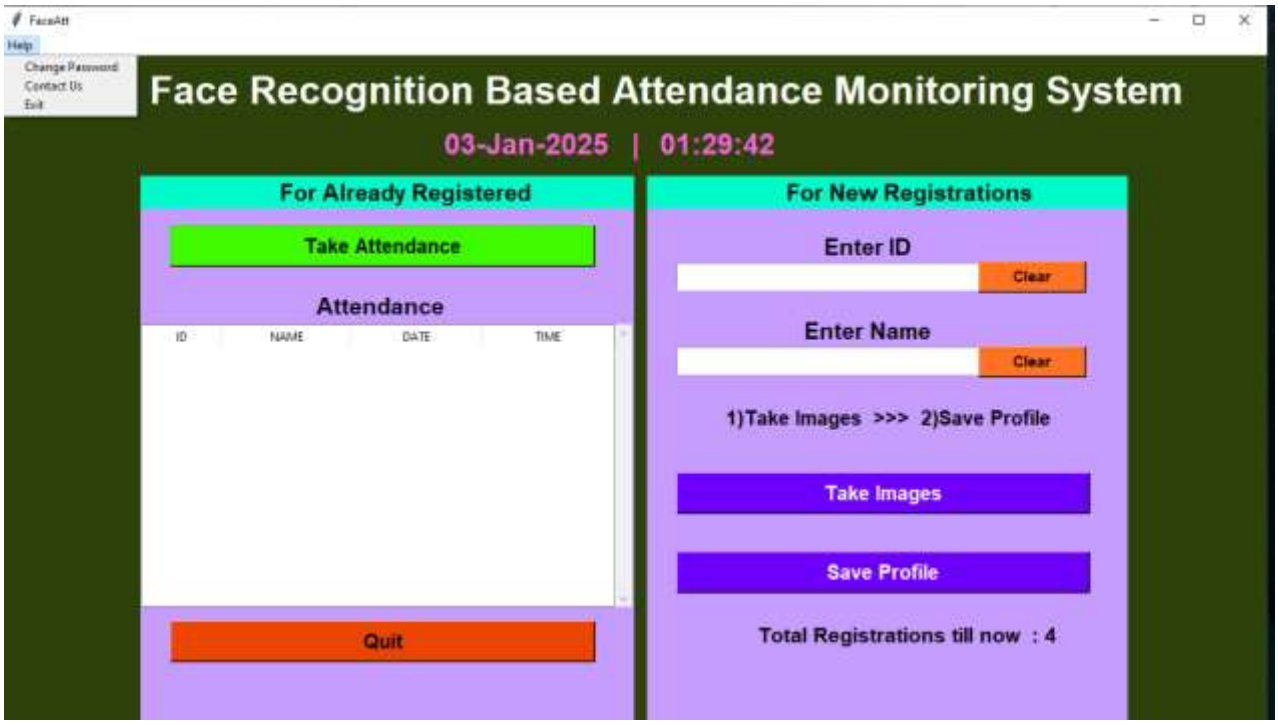

Figure 5.6: Help

5.3 Summary

The manual explains how users can mark their attendance simply by facing the camera, and how the system automatically records their presence. Additionally, it provides guidelines for troubleshooting, maintaining privacy, and ensuring data security. This manual is designed to help both administrators and users effectively operate the system for efficient and reliable attendance tracking.

Chapter 6 Project Summary

6.1 Introduction

The aim of this project is to capture the video of the students, convert it into frames, relate it with the database to ensure their presence or absence, mark attendance to the particular student to maintain the record. The Automated Classroom Attendance System helps in increasing the accuracy and speed ultimately achieve the high precision real-time attendance to meet the need for automatic classroom evaluation.

6.2 Project Limitation

While the Face Recognition Attendance System offers a promising solution, several limitations and constraints impacted its development and functionality:

- The system's performance can be affected by environmental factors such as lighting conditions, camera quality, and the angle at which a face is captured. In some scenarios, the system may struggle with misidentifications or may fail to recognize faces under suboptimal conditions.
- The project relied on basic hardware for testing, which limited the ability to implement advanced features such as high-definition cameras or multi-angle recognition, potentially reducing the overall system performance.
- The system currently faces challenges in handling multiple simultaneous attendance scans in busy environments, such as classrooms or offices with a high volume of individuals. Full real-time attendance tracking for large groups remains unaddressed.
- Due to time limitations, there was insufficient opportunity for extensive testing in diverse environments or with large datasets. This limited the ability to fine-tune the system for all potential real-world scenarios.

6.3 Scope

The main intention of this project is to solve the issues encountered in the old attendance system while reproducing a brand new innovative smart system that can provide convenience to the institution. In this project, an application will be developed which is capable of recognizing the identity of each individuals and eventually record down the data into a database system. Apart from that, an excel sheet is created which shows the students attendance and is directly mailed to the respected faculty

Multiple recognition in a frame is excluded from the system now but in future this, might be added to make the system works better.

6.4 Future Work

The future scope of the project can be integrated with the hardware components for example GSM through which a monthly list of the defaulter students can be sent to the mentor. Additionally, an application can be developed to help students to maintain a track of their attendance. It can also be used in offices where a large group of employees sit in a hall and their attendance will be marked automatically by capturing a video but for this the accuracy of the recognition needs to be improved.

Any future work on the system should involve students in the web portal so students can view their attendance and interact with the system.

6.5 Conclusion

The Face Recognition Attendance System successfully integrates advanced technologies to provide a seamless, efficient, and reliable method for tracking attendance. Through the use of machine learning algorithms and facial recognition techniques, the system eliminates the need for manual attendance marking, reducing human error and the potential for fraudulent attendance practices. By utilizing the powerful capabilities of image processing, the system ensures accurate identification even in diverse environments, enhancing both security and convenience.

While the system shows great promise, further improvements, such as optimizing the model for various lighting conditions and real-time performance, could enhance its robustness. Future work could involve integrating features such as notifications, detailed reports, and enhanced user interfaces for a more comprehensive attendance solution. Overall, the Face Recognition Attendance System proves to be a practical innovation that has the potential to revolutionize attendance management.

REFERENCES

[1] Michael Dobson, Douglas Ahlers, Bernie DiDario, <Attendance Tracking System", United States Patent Application Publication, Pub. No.: US 2006/0035205 A1, Feb.16, 2006.

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APPENDICES

Appendix A: User Feedback

- Teacher Feedback: "The system is easy to set up and use. However, during the peak hours, attendance marking takes a bit longer due to the high number of users."

- Student Feedback: "The system is fast and accurate. Sometimes, it struggles with recognition if multiple students are standing too close together."

Appendix B: Performance Test Results

- Test 1: Load Testing with 1000 concurrent users

  Result: System performed well, response time remained under 3 seconds.

- Test 2: Stability Testing over 48 hours of continuous usage

  Result: No crashes or downtime reported.

FaceATT: A face recognition attendance system

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