A

Mini Project Report

on

Attendance System using Face Recognition

Submitted in partial fulfillment of the requirements for the degree

Third Year Engineering – Information Technology

by

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Under The Guidance Of

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Academic year : 2023-24

CERTIFICATE

This to certify that the Mini Project report on **Attendance System using Face Recognition** has been submitted by **Praniv Warungashe (21104031), Siddhi Desale (21104135) and Sushant Mhatre (21104002)** who are bonafide students of A. P. Shah Institute of Technology, Thane as a partial fulfillment of the requirement for the degree in **Information Technology**, during the academic year **2023-2024** in the satisfactory manner as per the curriculum laid down by University of Mumbai.

Ms. Geetanjali Kalme

Guide

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1. **1.**

2.

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Date:

ACKNOWLEDGEMENT

This project would not have come to fruition without the invaluable help of our guide **Ms. Geetanjali Kalme,** Expressing gratitude towards our HoD,**Dr. Kiran Deshpande**, and the Department of Information Technology for providing us with the opportunity as well as the support required to pursue this project. We would also like to thank our project coordinator **Ms. Sonal Jain** who gave us her valuable suggestions and ideas when we were in need of them. We would also like to thank our peers for their helpful suggestions.

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ABSTRACT

The integration of face recognition technology in attendance systems revolutionizes traditional tracking methods. facilitate quick and secure attendance marking, while face recognition offers a contactless alternative. These technologies enhance efficiency, accuracy, and security in attendance management across education, corporate, and event sectors. Leveraging face recognition optimizes administrative processes and improves data accuracy. Implementing these technologies involves generating unique developing facial recognition systems, and ensuring seamless integration with existing platforms. By adopting innovative solutions, organizations can streamline attendance tracking and enhance overall operational efficiency.

Chapter 1

Introduction

In today's fast-paced world, managing attendance efficiently is a critical aspect for various institutions and organizations. Traditional methods of attendance tracking, such as manual roll calls or biometric systems, often prove to be cumbersome, time-consuming, and susceptible to errors. In response to these challenges, modern technologies such as facial recognition scanning have emerged as innovative solutions to streamline the attendance process.

This project aims to explore the integration of facial recognition technology to develop an advanced attendance system. By harnessing the power of machine learning algorithms, this system offers a convenient, accurate, and secure method for recording attendance in diverse settings, including educational institutions, corporate offices, and events.

a. Innovative Integration: Our attendance system blends facial recognition a technologies, leveraging machine learning algorithms. It offers a seamless and secure solution for tracking attendance in various settings, enhancing efficiency and accuracy.

b. Efficiency and Accuracy: By harnessing machine learning, our system ensures swift identification and verification, eliminating manual processes and reducing errors associated with traditional attendance tracking methods.

c. Enhanced Security: Facial recognition authentication strengthens security measures, preventing unauthorized access and ensuring data integrity, thus fostering a safe and trustworthy environment.

d. User-Friendly Interface: With an intuitive interface, our system provides a user-friendly experience, facilitating easy adoption and management for administrators and users alike, fostering productivity and satisfaction.

1.1 Purpose:

a. Attendance Tracking: The project aims to simplify attendance management by automating the process through facial recognition integration, reducing administrative burden and enhancing efficiency in various educational and corporate environments.

b. Security Measures: By implementing facial recognition technology, the system ensures a secure attendance tracking process, mitigating risks associated with manual entry or proxy attendance and fostering accountability within organizations.

c. Accurate Data Collection: Leveraging machine learning algorithms, the system improves the accuracy of attendance records, minimizing errors and discrepancies often encountered with traditional methods, thereby providing reliable data for analysis and decision-making.

d. Improved Time Management: With the automation of attendance tracking, the project enables better utilization of time for both administrators and attendees, eliminating the need for manual verification processes and optimizing resource allocation within institutions and businesses.

e. Facilitating Contactless Solutions: Especially in the context of public health concerns, the project promotes contactless interactions through facial recognition technology, reducing the risk of germ transmission associated with traditional attendance methods and promoting a safer environment.

1.2 Problem Statement:

In the realm of education institutions and events, the conventional methods of attendance tracking are plagued by inefficiencies, inaccuracies, and a lack of adaptability to the evolving technological landscape. The current reliance on manual roll calls, paper sign-ins, and biometric systems has proven to be time-consuming, error-prone, and resource-intensive, creating a pressing need for a modernized attendance solution.

Key Challenges:

a. Inefficiency and Time Consumption: Manual attendance processes, such as roll calls, consume valuable instructional time and are susceptible to errors.Traditional biometric systems may face technical glitches, leading to delays and disruptions in the attendance recording process.

b. Limited Adaptability: Existing attendance systems often lack adaptability to diverse educational settings and events, hindering their effectiveness.Incompatibility with modern technological trends makes these systems less appealing to tech-savvy students and event participants.

c. Data Inaccuracy and Security Concerns: Manual entry of attendance is prone to human errors, resulting in inaccurate records and potential disputes. Biometric systems may raise concerns about data security and privacy, as fingerprint or card-based systems can be vulnerable to breaches.

d. Administrative Overhead: Educational institutions and event organizers grapple with the administrative burden associated with manual attendance tracking, diverting attention from core

responsibilities. Paper-based records are cumbersome to manage, and manual data entry is labor-intensive

e. Environmental Impact: The paper-based attendance system contributes to environmental waste, undermining sustainability efforts. Inefficient systems that require physical infrastructure contribute to unnecessary resource consumption.

Solution Proposed:

The proposed solution entails the development and implementation of an innovative attendance system that combines facial recognition technology scanning to address the identified challenges in attendance tracking within educational institutions and events.

a. Facial Recognition Technology: Utilizing advanced facial recognition algorithms to accurately identify and authenticate participants based on their unique facial features.Integration of facial recognition software with existing hardware such as cameras or mobile devices for seamless attendance capture.

b. User-Friendly Interface: Designing an intuitive and user-friendly interface for educators , ensuring ease of use and accessibility.Providing clear instructions for facial recognition enrollment generation to streamline the onboarding process.

The proposed solution aims to revolutionize attendance tracking practices in educational institutions and events by providing a reliable, efficient, and technologically-driven solution. By harnessing the power of facial recognition technology, the system seeks to streamline the attendance process, enhance data accuracy, improve security, and promote user engagement. Ultimately, the implementation of this advanced attendance system is expected to optimize resource utilization, mitigate administrative burdens, and elevate the overall attendance management experience for educators, participants, and event organizers alike.

1.3 Objectives

The objectives of implementing the proposed attendance system using facial recognition technology in educational institutions and events are as follows:

a. Efficiency Enhancement: To **s** treamline the attendance tracking process to save time and resources for both educators and event organizers.Reduce the administrative overhead associated with manual attendance recording methods.

b. Accuracy Improvement: To improve the accuracy of attendance records by leveraging facial recognition technology, which identifies participants based on unique facial features.Ensure that attendance data is reliable and free from human error or manipulation.

c. User Experience Optimization: To design an intuitive and user-friendly interface for participants to enroll in facial recognition systems .Provide clear instructions and guidance to ensure that participants can easily log their attendance using the system.

d. Integration and Compatibility: To ensure seamless integration with existing educational databases and event management systems to facilitate data exchange and interoperability.Design the system to be compatible with a variety of platforms and devices to accommodate diverse technological environments.Continuous Improvement:Implement machine learning algorithms to continuously enhance facial recognition accuracy and system performance over time.

1.4 Scope:

The scope of implementing the proposed attendance system using facial recognition technology in educational institutions and events encompasses the following areas:

a. Enrollment Process: Developing a mechanism for participants to enroll their facial features into the system securely and efficiently. This includes capturing facial images and storing them securely in the database.

b. Attendance Tracking: Implementing facial recognition technology to accurately track attendance during classes, lectures, or events. This involves real-time identification of participants based on their unique facial features.

c. User Interface Design: Designing an intuitive and user-friendly interface for participants to interact with the facial recognition system. This includes providing clear instructions and guidance for enrollment and attendance logging.

Chapter 2

Literature Review

Sr.No	Title of Research paper	Authors	Publication Years	Technology Stack	Key Findings
1.	"Smart Attendance System Using Machine Learning"	Prof. Shweta S Bagali, Dr K Amuthabala, Prof. Iranna Amargol, Mr H Prajwal	2022	Computer Vision, Machine Learning, Face Recognition,Dot Net	-Utilizes histogram-arrangedslopes, supportvector machines,and deep convolutional networks for facial recognition -Develops a real-time face detection and attendance marking application -Integrates with Dot Net APIs for camera input
2.	"Evaluation of Attendance Tracking Systems: Face Recognition vs. QR Code"	Patel, S. and Lee, K.	2022	Java, Spring Boot, OpenCV, ZXing	-Face recognition systems offer higher accuracy but require more computational resources -QRcode systems are less resource-intensive but may suffer in low-light conditions.

3.	"Comparing the Efficiency of Face Recognition and QR Code Attendance Systems"	Garcia, M.etal.	2022	C++, OpenCV, Python, Django, QR Code API	-Face recognition systems show higher user acceptance due to convenience. -QR code systems are simpler to implement and maintain in various environments
4	Integrating Machine Learning for Face Recognition in Attendance Systems	Smith, A., & Johnson, B.	2023	Machine Learning	The paper explores the integration of machine learning techniques for face recognition in attendance systems.
5	A Novel Approach to Attendance Tracking: Machine Learning and Face Recognition	Patel, S., & Gupta, R.	2022	Machine Learning,python	This paper presents a novel approach to attendance tracking using machine learning and face recognition technologies.

Chapter 3

Proposed System

User-Centric Interface: The proposed attendance system prioritizes user convenience by offering a seamless and intuitive interface. Students and faculty can easily mark attendance through facial recognition, eliminating the need for manual processes like paper sign-ins or card swipes.

a. Efficient Attendance Tracking: Leveraging machine learning algorithms, the system efficiently tracks attendance by recognizing faces in real-time. This minimizes errors and reduces the time spent on manual attendance taking, allowing educators to focus more on teaching.

b. Dynamic Adaptation: The system continuously learns and adapts to improve accuracy over time. Through machine learning algorithms, it can adjust to varying lighting conditions, facial expressions, and other environmental factors, ensuring reliable attendance records.

c. Real-Time Monitoring: Students and faculty can monitor attendance records in real-time, providing immediate feedback and insights into attendance patterns. This feature enables proactive intervention for students who may require additional support to improve their attendance.

d. Enhanced Security and Accountability: By utilizing facial recognition technology, the system enhances security measures by ensuring that only authorized individuals can mark attendance. This increases accountability and reduces the risk of fraudulent attendance practices..

f. Improved Student Engagement: The automated attendance system promotes student engagement by minimizing disruptions and maximizing instructional time. Students can focus more on learning, knowing that attendance tracking is efficient and accurate.

g. Compliance and Transparency: The system ensures compliance with attendance policies and regulations while maintaining transparency in attendance management. It provides a reliable audit trail, demonstrating adherence to institutional guidelines and standards.

Similar to the proposed system for student support, application, and alumni engagement, this attendance system using machine learning and face recognition revolutionizes traditional attendance tracking methods. It simplifies processes, enhances accuracy and security, and fosters a more engaged educational environment through advanced technology integration.

3.1 Features and Functionalities:

1. Attendance Tracking:

- Automated Face Recognition for Attendance Marking.
- Real-Time Attendance Monitoring.
- Attendance Records Management.

2. Scalability and Adaptability:

- Scalable Infrastructure to Handle Growing User Base.
- Adaptability to Different Environments and Conditions.
- Continuous Learning and Improvement of Recognition Algorithms.

3. Integration:

- Integration with Existing Campus Management Systems.
- Compatibility with Different Devices and Platforms.
- Seamless Integration with Learning Management Systems (LMS).

Chapter 4

Requirement Analysis

4.1 User Interface and Experience:

a. Responsive Design: The user interface should adapt seamlessly to different screen sizes and devices, providing an optimal viewing experience for users.

b. Intuitive Navigation: Clear and intuitive navigation should guide users through the attendance marking process, ensuring ease of use for both students and faculty.

c. Accessibility: The system should adhere to accessibility standards to ensure that users with disabilities can easily interact with the interface.

d. Performance Optimization: Fast loading times and efficient interactions are crucial for a smooth user experience, requiring optimization of code and resources.

4.2 Functional Requirements:

a. User Registration and Authentication: Secure registration and login processes with multi-factor authentication to prevent unauthorized access to attendance data.

b. Attendance Tracking: Automated attendance tracking using face recognition technology, with real-time updates for both students and faculty.

c. Reporting and Analytics: Generation of comprehensive reports and analytics on attendance trends, including attendance rates and patterns.

d. Integration with Academic Systems: Seamless integration with existing academic systems to synchronize attendance data with student records.

4.3 Database and Data Management:

a. Data Storage: Efficient storage and retrieval of attendance data, utilizing databases optimized for handling large volumes of information.

b. Scalable Database Design: The database schema should be designed to scale easily to accommodate the growing volume of attendance records over time.

4.4 Non-Functional Requirements:

a. Security: Robust security measures should be implemented to protect the integrity and confidentiality of attendance data. This includes encryption of data both in transit and at rest, access controls to prevent unauthorized access, and measures to prevent tampering or manipulation of attendance records.

b. Accuracy: The facial recognition algorithms should have high accuracy in identifying participants, minimizing false positives and false negatives. The system should continuously improve its accuracy through machine learning algorithms and regular updates to the facial recognition models.

c. Compatibility: The system should be compatible with a variety of devices and platforms commonly used in educational institutions and event venues. This includes desktop computers, laptops, tablets, and smartphones, as well as different operating systems such as Windows, macOS, iOS, and Android.

d. Compliance: The system should comply with relevant regulations and standards governing facial recognition technology, data protection, and privacy. This includes adherence to laws such as GDPR (General Data Protection Regulation) and ethical guidelines for the use of biometric data in educational settings.

Chapter 5

Project Designing

5.1 Flow Chart on working of system

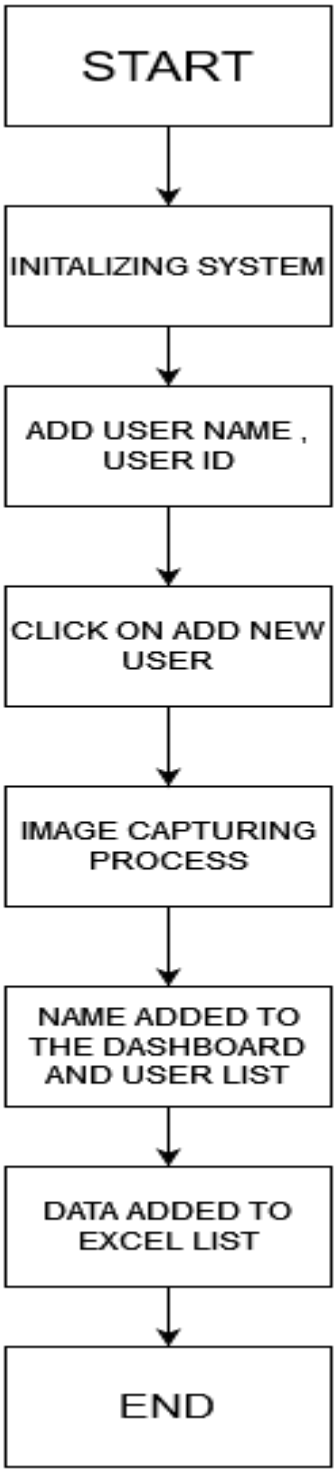


Fig 5.1a:- Training Image Flowchart

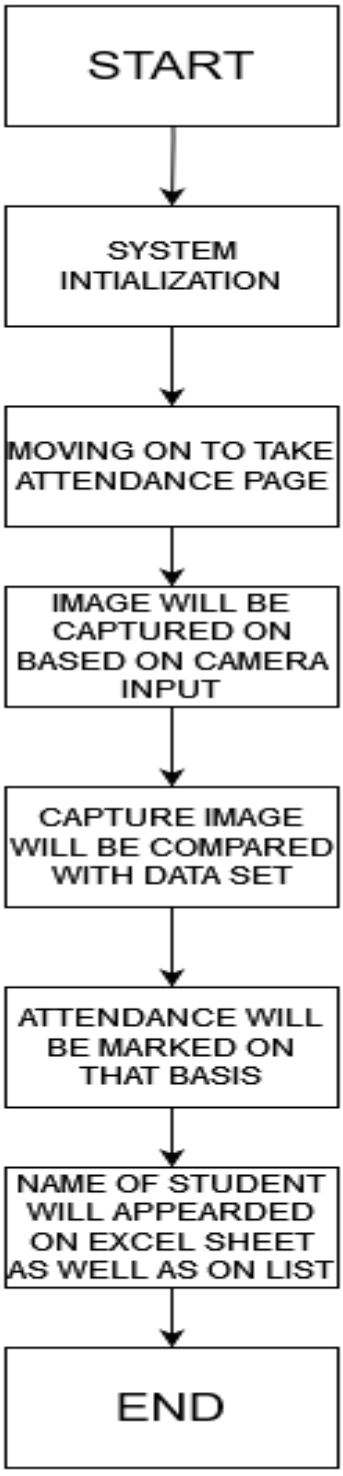


Fig 5.1b:- Testing or Deplying Image Flowchart

Explaination of fig 5.1a

- Initialization: The system starts.
- Add User Info: Enter the user's name and ID.
- Add New User: Confirm adding the user.
- Image Capture: Capture the user's image.
- Dashboard & List: User's name is added to the dashboard and user list.
- Excel Data: All data is stored in an Excel sheet.
- End: Process completes.

Explaination of fig 5.1b

- Initialization: The system starts.
- Take Attendance Page: The system moves to the attendance page.
- Image Capture: An image is captured based on camera input.
- Comparison with Dataset: The captured image is compared with a dataset.
- Attendance Marking: Attendance is marked based on this comparison.
- Excel Record: The student's name is recorded on an Excel sheet and list.
- End: The process completes.

5.2 Data Flow Diagram of system

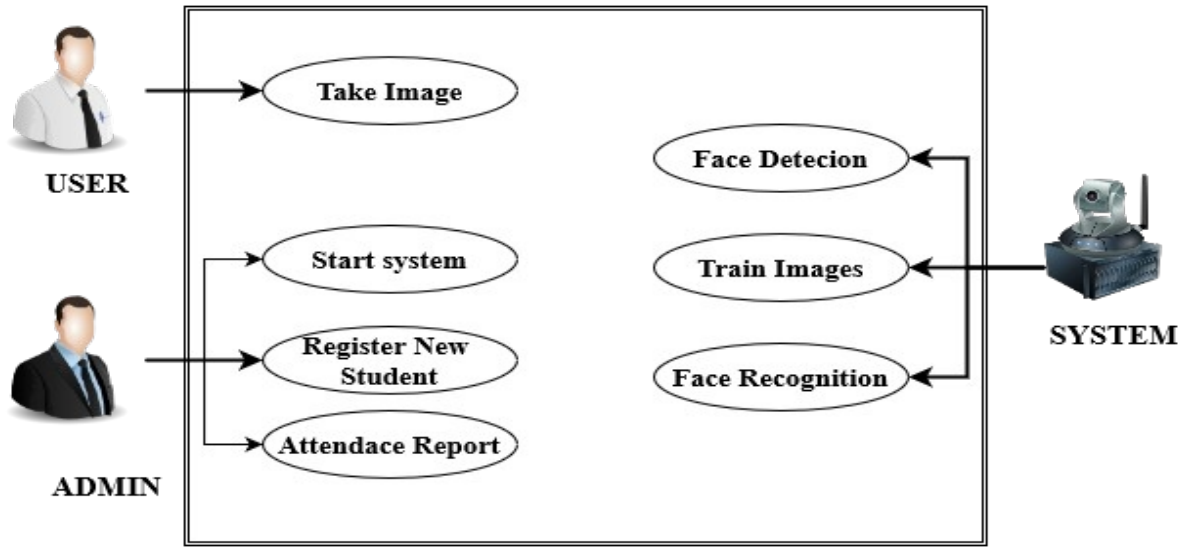


Fig 5.2a:- Use Case Diagram

Explaination of fig 5.2a

- From User image will be take for reccognition and detection for face recognition system for attendance.
- Admin will start the system for attencdance as well as for accessing the report.
- System will train itself based on inputs given and report will be provided on that basis.

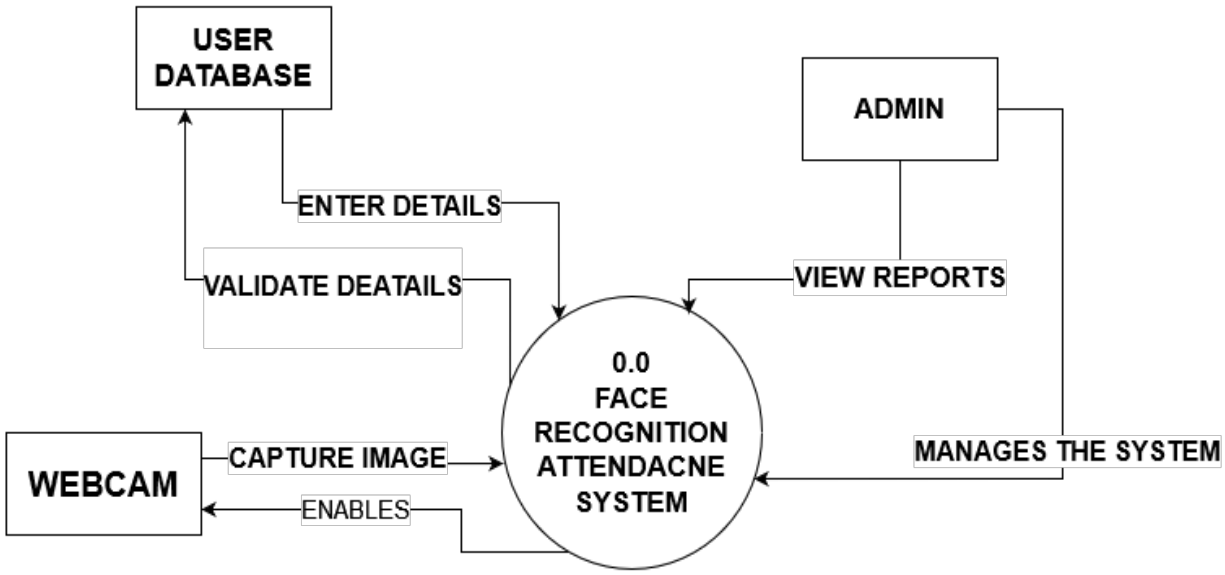


Fig 5.2b:- Data Flow Diagram of System (Level 0)

Explaination of fig 5.2b

I. User Interaction:

a. Users enter their details into theUser Database.

b. The system validates these details.

II. Image Capture:

a. A webcam captures the user's image, enabling the face recognition process.

III. Face Recognition Process:

a.The captured image undergoes face detection

IV. Admin Actions:

a. The Admin views reports generated by the system.

b. The Admin manages the system.

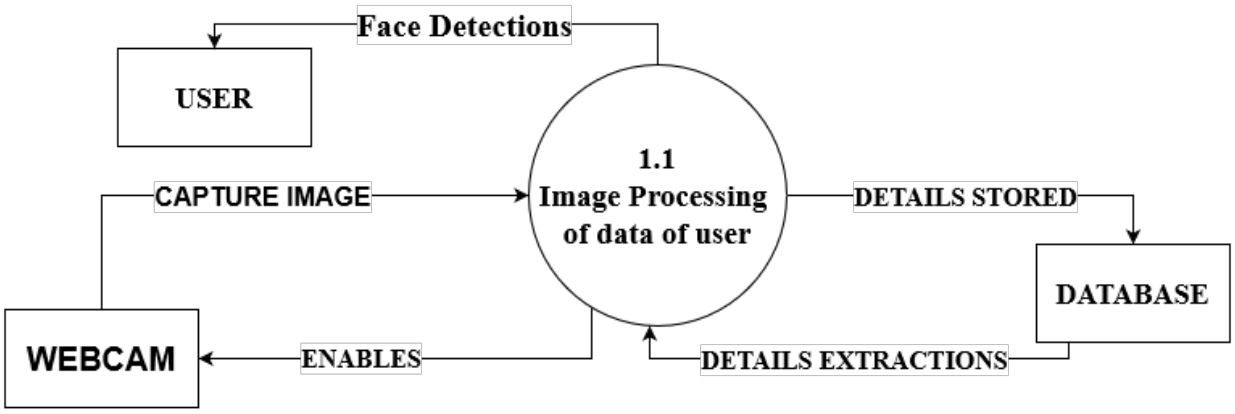


Fig 5.2c:- Data Flow Diagram of System (Level 1)

Explaination of fig 5.2c

I. Image Capture:

a. The system uses a webcam to capture an image of the user.

II. User:

a. Image is capture of user faces

III. Image Processing:

a. The captured image undergoes details extractions.

b. These extracted details are then stored in a database

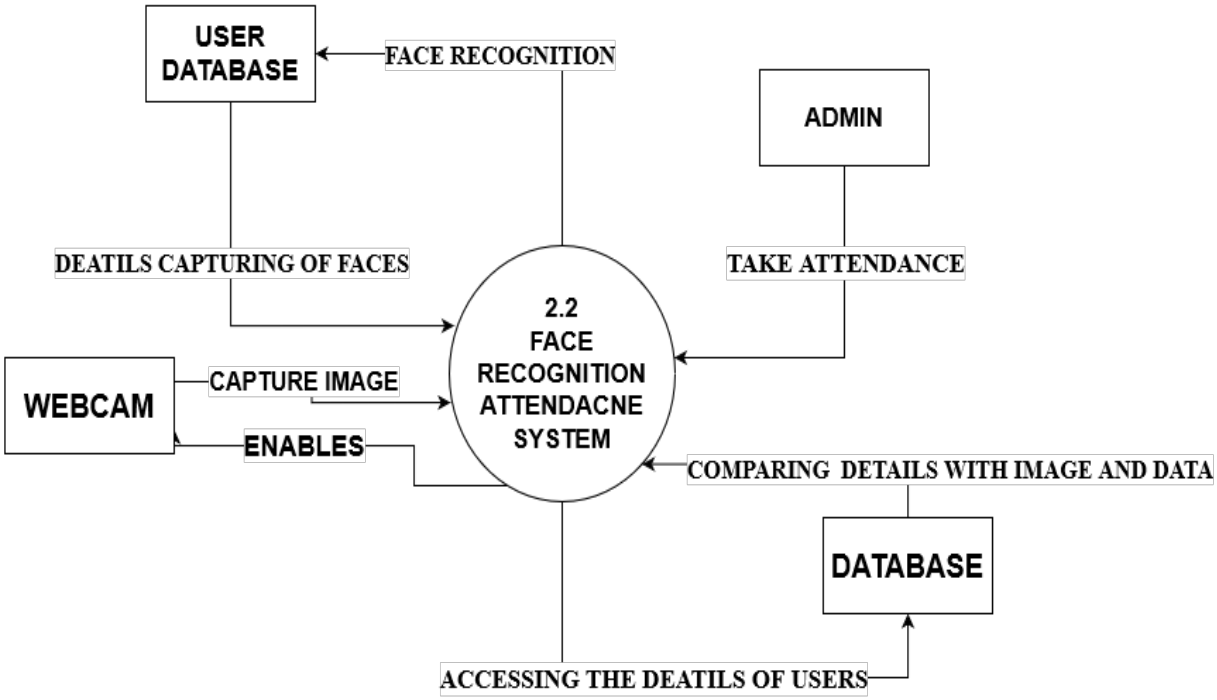


Fig 5.2d:- Data Flow Diagram of System (Level 2)

Explaination of fig 5.2d

I. Admin

a. admin will take attendance

II. Image Capture:

a. The system uses a webcam to capture an image of the user.

III. User:

a. Images is capture of user faces

IV. Image Processing(attendance marking):

a. The captured image undergoes comparing with details extractions with image captured faces via web cam.

b. The attendanceis marked in a database after matching of face with user.

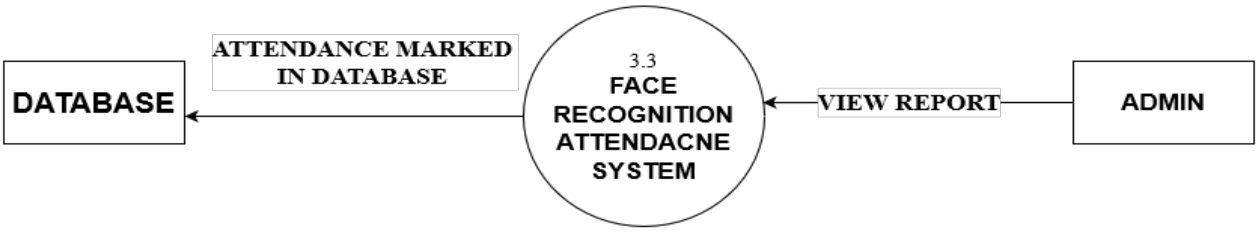


Fig 5.2e:- Data Flow Diagram of System (Level 3)

Explaination of fig 5.2e

I. Admin

a. admin will access attendance report.

II. Image Processing(Attendace marked in database):

a. The attendanceis marked in a database after matching of face with user and csv file is created in excel format.

5.3 System Architecture Diagram of system

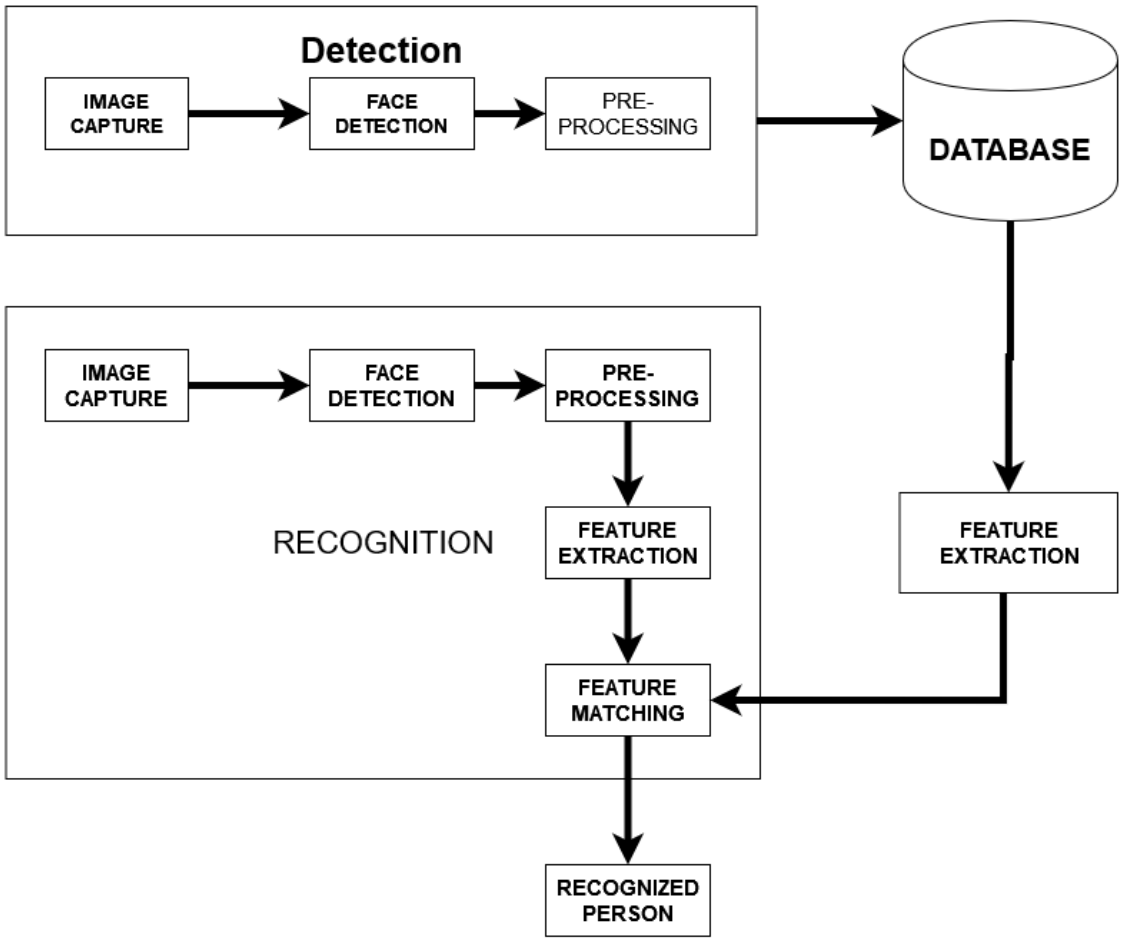


Fig5.3a:- System Architecture Diagram of System

Explaination of fig 5.3a

I. Detection

a. Capturing image from webcam

b. Face Detection and Image pre-processing by System in database

II. Database

a. The data of face image and user data is stored in Database

III. Recognition

a. To mark attencdance image is detected using webcam.

b. Image or face detected is using system to compare with database.

c. After face detection the attendance is marked when daabase is matched with face from webcam.

Chapter 6

Technical Specification

6.1 Technology stack

A. Frontend:- Html,css,js,Python

B. Database:- Excel,OS ,OpenCv**,**Mysql

C. Backend:- Python,Flask**,** PhpMyAdmin

D. Libraries used in Python:

a. Pandas

b. Numpy

c. Sklearn

d.Flask_cors

e. Joblib

f. Matplotlib

E. Algorithms used in project:

a. Haarcascades

b. Open cv

c. K-Nearest Neighbors (KNN)

The technology stack provided outlines the tools and technologies used for developing a machine learning-based attendance system using face recognition. Here's a brief explanation of each component:

6.2 Technolgy Stack Details

A. Frontend (HTML, CSS, JavaScript): Responsible for the user interface where users interact with the attendance system. This includes designing web pages, forms, and handling user interactions.

B. Python (Backend): Python serves as the backend language, responsible for processing requests, handling business logic, and interacting with the database.

C. Flask (Backend Framework): Flask is a micro web framework for Python used for building web applications. It facilitates handling HTTP requests, routing, and integrating with frontend components.

D. Database (Excel, OS, OpenCV): Excel, OS, and OpenCV might be utilized for storing and managing data related to attendance records, images, and other relevant information.

6.3 Libraries Used in Python:

a. Pandas: Used for data manipulation and analysis, which might be useful for managing attendance data.

b. Numpy: Essential for numerical computations and handling arrays or matrices, potentially used in image processing tasks.

c. Scikit-learn (Sklearn): Provides machine learning algorithms and tools for data mining and data analysis. Likely used for training and implementing the face recognition model.

d. Flask_cors: Flask extension for handling Cross-Origin Resource Sharing (CORS), necessary for allowing communication between frontend and backend on different domains.

e. Joblib: Used for serialization and deserialization of Python objects, which might be used for saving trained machine learning models.

f. Matplotlib: A plotting library for creating visualizations and graphs, which might be used for displaying attendance statistics or visualization of data

6.4 Algorithms Used:

a. Haarcascades: Used for detecting faces in images or video frames, a common technique in computer vision.

b. OpenCV: An open-source computer vision and machine learning software library. It's likely used for face detection, image preprocessing, and possibly implementing the face recognition algorithm.

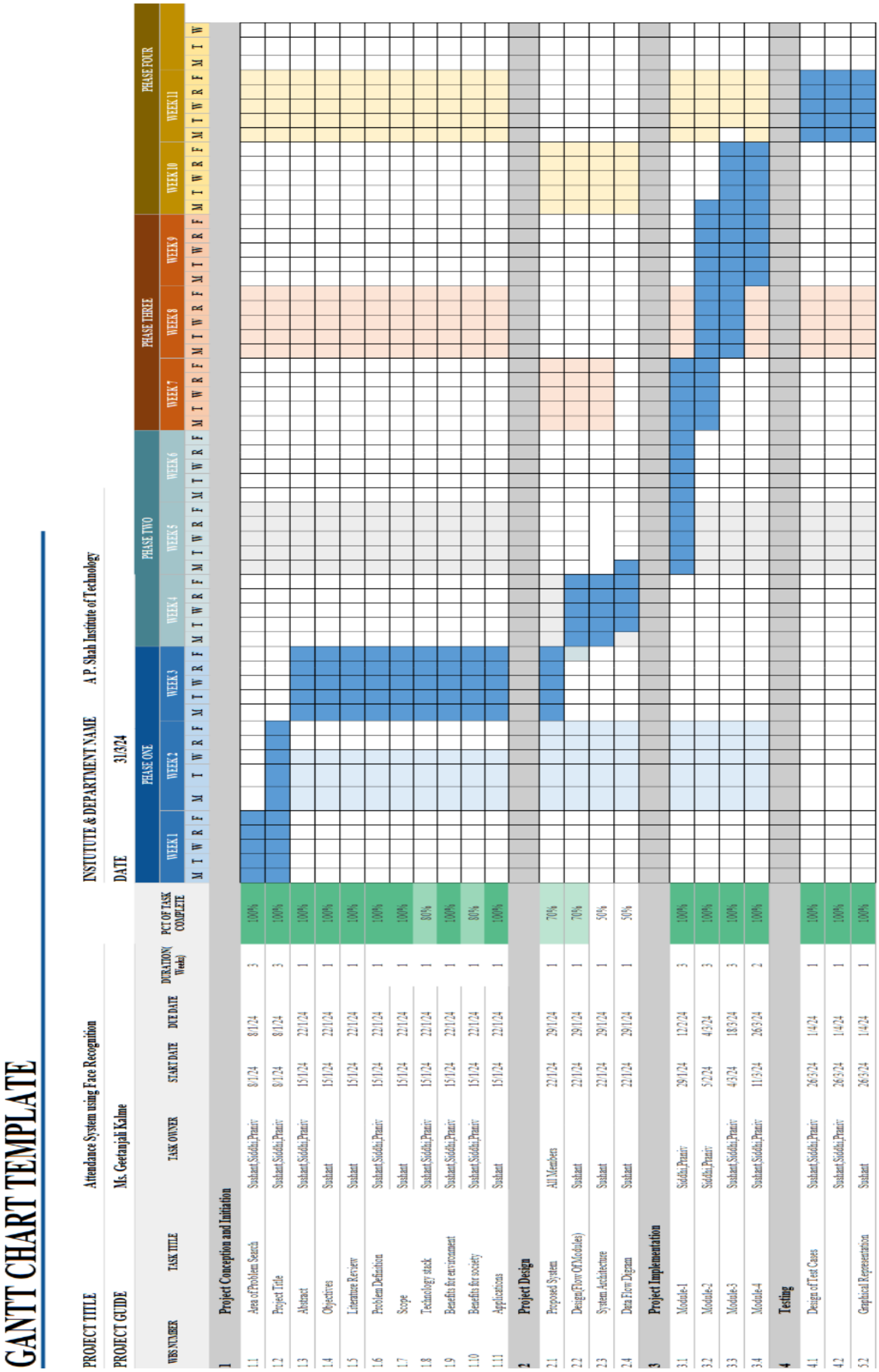
c. KNN (K-Nearest Neighbors): A simple and effective classification algorithm used in pattern recognition. It might be used for recognizing faces based on their features.

Chapter 7

Project Scheduling

Sr No.	Group Members	Time Duration	Work to be done
1	Praniv Warungashe Siddhi Desale Sushant Mhatre	Week 1 - Week 4	Area of Problem Search , Topic confirmation Designing of Prototype and approval for prototype
2		Week 5- Week 8	Creation of GUI , FRONTEND and BACKEND .
3		Week 9 – Week 12	Connection of FRONTEND TO BACKEND
4		By End of Week	DATABASE CREATION ,APPLY-ING ALOGRITM AND TESTING THE PROJECT

Gantt Chart



GANTT CHART TEMPLATE

PROJECT TITLE	Attendance System using Face Recognition	INSTUTUTE & DEPARTMENT NAME	A P. Shah Institute of Technology
PROJECT GUIDE	Ms. Geetanjali Kalme	DATE	31/3/24

WBS NUMBER	TASK TITLE	TASK OWNER	START DATE	DUE DATE	DURATION(Weeks)	PCT OF TASK COMPLETE
1	**Project Conception and Initiation**					
1.1	Area of Problem Search	Sushant,Siddhi,Pranjv	8/1/24	8/1/24	3	100%
1.2	Project Title	Sushant,Siddhi,Pranjv	8/1/24	8/1/24	3	100%
1.3	Abstract	Sushant,Siddhi,Pranjv	15/1/24	22/1/24	1	100%
1.4	Objectives	Sushant	15/1/24	22/1/24	1	100%
1.5	Literature Review	Sushant	15/1/24	22/1/24	1	100%
1.6	Problem Definition	Sushant,Siddhi,Pranjv	15/1/24	22/1/24	1	100%
1.7	Scope	Sushant	15/1/24	22/1/24	1	100%
1.8	Technology stack	Sushant,Siddhi,Pranjv	15/1/24	22/1/24	1	80%
1.9	Benefits for environment	Sushant,Siddhi,Pranjv	15/1/24	22/1/24	1	100%
1.10	Benefits for society	Sushant,Siddhi,Pranjv	15/1/24	22/1/24	1	80%
1.11	Applications	Sushant	15/1/24	22/1/24	1	100%
2	**Project Design**					
2.1	Proposed System	All Members	22/1/24	29/1/24	1	70%
2.2	Design(Flow Of Modules)	Sushant	22/1/24	29/1/24	1	70%
2.3	System Architecture	Sushant	22/1/24	29/1/24	1	50%
2.4	Data Flow Digram	Sushant	22/1/24	29/1/24	1	50%
3	**Project Implementation**					
3.1	Module-1	Siddhi,Pranjv	29/1/24	12/2/24	3	100%
3.2	Module-2	Siddhi,Pranjv	5/2/24	4/3/24	3	100%
3.3	Module-3	Sushant,Siddhi,Pranjv	4/3/24	18/3/24	3	100%
3.4	Module-4	Sushant,Siddhi,Pranjv	11/3/24	26/3/24	2	100%
4	**Testing**					
4.1	Design of Test Cases	Sushant,Siddhi,Pranjv	26/3/24	1/4/24	1	100%
4.2		Sushant,Siddhi,Pranjv	26/3/24	1/4/24	1	100%
5.2	Graphical Representation	Sushant	26/3/24	1/4/24	1	100%

Chapter 8

Implementation

app.py > dashboard

Click here to ask Blackbox to help you code faster

```
import cv2
import os
from flask import Flask, render_template, request, redirect, session
from datetime import date
from datetime import datetime
import numpy as np
from sklearn.neighbors import KNeighborsClassifier
import pandas as pd
import joblib
import mysql.connector
from flask_cors import CORS


# Defining Flask App
app = Flask(__name__)
app.secret_key = 'Mykey'
CORS(app)
```

Fig8.1 Import required Libraries

This Python script initializes a Flask web application for a project involving image processing, machine learning, and database interaction. It imports libraries such as OpenCV for image processing, Flask for web framework, scikit-learn for machine learning algorithms, and mysql.connector for database interaction. The Flask app is configured with a secret key for session management and CORS enabled for cross-origin requests. A machine learning model, likely a K Nearest Neighbors classifier, is utilized, potentially trained elsewhere and loaded using joblib. Database interaction with MySQL is expected, although specific details are not clear. The script defines various routes to handle different functionalities of the web application, such as rendering HTML templates and processing form data. Session management using the session object is implemented but not explicitly demonstrated in the provided snippet. Overall, this script sets up a Flask web application integrating image processing, machine learning model deployment, database interaction, and session management, though further examination of the complete code would provide clearer insight into its functionality.

```python
# A function which trains the model on all the faces available in faces folder
def train_model():
    faces = []
    labels = []
    userlist = os.listdir('static/faces')
    for user in userlist:
        for imgname in os.listdir(f'static/faces/{user}'):
            img = cv2.imread(f'static/faces/{user}/{imgname}')
            resized_face = cv2.resize(img, (50, 50))
            faces.append(resized_face.ravel())
            labels.append(user)
    faces = np.array(faces)
    knn = KNeighborsClassifier(n_neighbors=5)
    knn.fit(faces, labels)
    joblib.dump(knn, 'static/face_recognition_model.pkl')
```

Fig8.2 Training model

This Python function ‘train_model()’ is dedicated to training a machine learning model, likely for face recognition, utilizing images stored in the 'static/faces' directory. It initializes empty lists to store image data and corresponding labels, iterates through each user directory and image file within the specified directory, loads, resizes, and flattens each image, appending it to the data and its label to the labels list. After processing all images, it converts the data into numpy arrays and trains a K Nearest Neighbors classifier with 5 neighbors. Subsequently, the trained model is serialized and saved as a file named 'static/face_recognition_model.pkl' using joblib. Overall, this function automates the process of constructing a training dataset, training a face recognition model, and persisting it for future use, streamlining the face recognition system's development and deployment.

```python
# extract the face from an image
def extract_faces(img):
    try:
        gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
        face_points = face_detector.detectMultiScale(gray, 1.2, 5, minSize=(20, 20))
        return face_points
    except:
        return []


# Identify face using ML model
def identify_face(facearray):
    model = joblib.load('static/face_recognition_model.pkl')
    return model.predict(facearray)
```

Fig8.3 Extracting faces

This Python code defines two functions for face processing. The first function, extract_faces, takes an image (img) as input, converts it to grayscale using OpenCV, then employs a face detection model (face_detector) to detect faces within the image. Detected face coordinates are returned as a list of points. If an exception occurs during processing, an empty list is returned. The second function, identify_face, takes an array of face images (facearray) as input. It loads a pre-trained machine learning model for face recognition from a file named 'static/face_recognition_model.pkl' using joblib, and then uses this model to predict the identities of the faces in the input array. The predicted identities are returned. If there's an error during processing, an empty list is returned.

```
def extract_attendance():
    df = pd.read_csv(f'Attendance/Attendance-{datetoday}.csv')
    names = df['Name']
    rolls = df['Roll']
    times = df['Time']
    l = len(df)

    # Calculate attendance percentage for each user
    attendance_counts = df['Name'].value_counts()
    total_sessions = l  # Total number of sessions
    attendance_percentage = {}
    for name, count in attendance_counts.items():
        attendance_percentage[name] = (count /1) * 100

    return names, rolls, times, l
```

Fig8.4 Extracting Attendance

This Python function extract_attendance() is designed to process attendance data stored in a CSV file. It utilizes pandas to read the CSV file named based on the current date (datetoday). The function then extracts columns containing names, rolls, and timestamps from the DataFrame. Additionally, it calculates the total number of rows in the DataFrame (1). The attendance percentage for each user is computed by counting the occurrences of each name and dividing it by the total count of rows in the DataFrame. The result is multiplied by 100 to get the percentage. The function returns four variables: names, rolls, and times, containing attendance details, and 1, representing the total count of sessions. However, there's a syntax error in the code (1 = len(df)), which should be corrected to total_sessions = len(df) to assign the count of sessions to the variable total_sessions.

Chapter 9

Result and Discussion

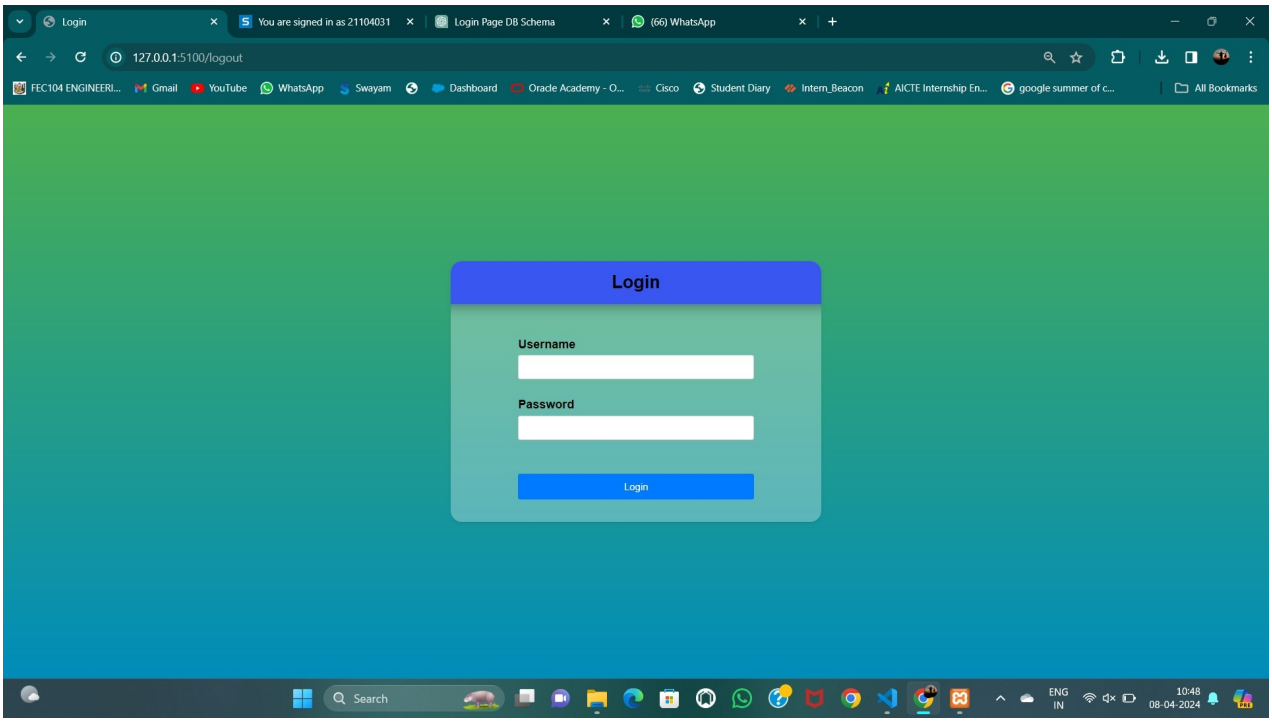


Fig 9.1:- Login Page

A login page is a web interface where users input their credentials, typically a username/email and password, to authenticate their identity and gain access to a system or website, crucial for security and user privacy.

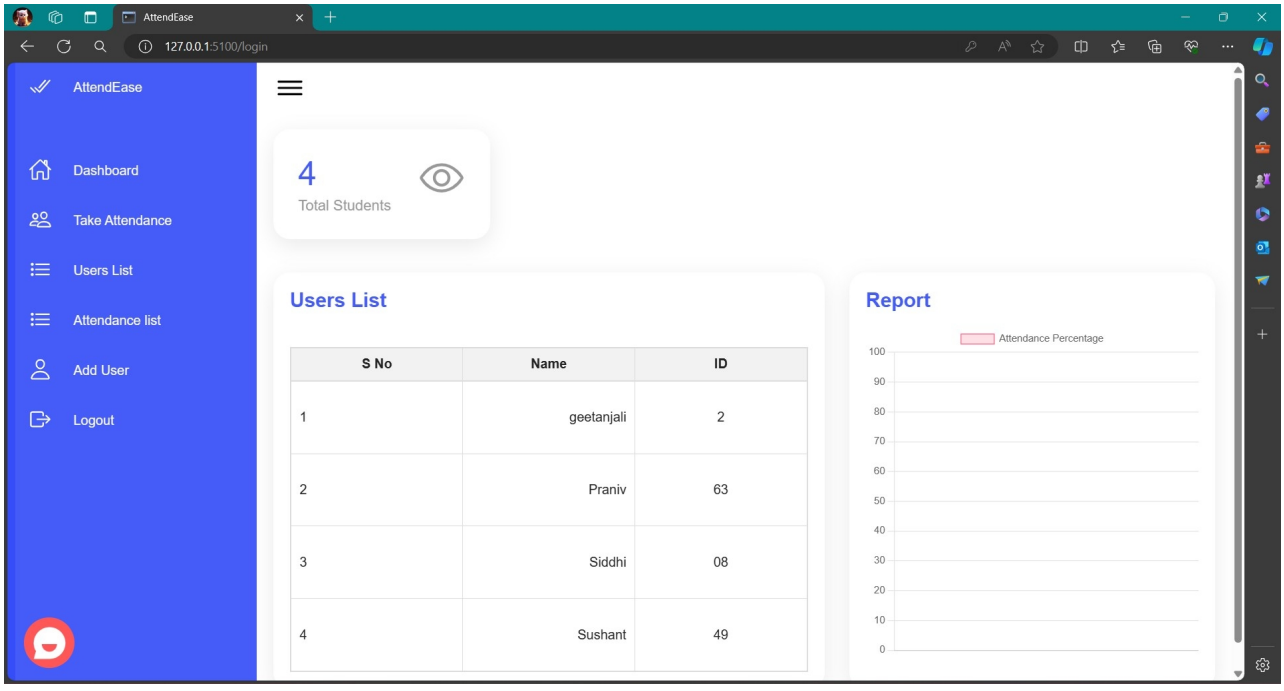


Fig 9.2:- DashBoard page

DashBoard Page :- The DashBoard Page serves as the central hub, offering a dashboard with quick access to users to function , and essential features, and user-friendly experience.

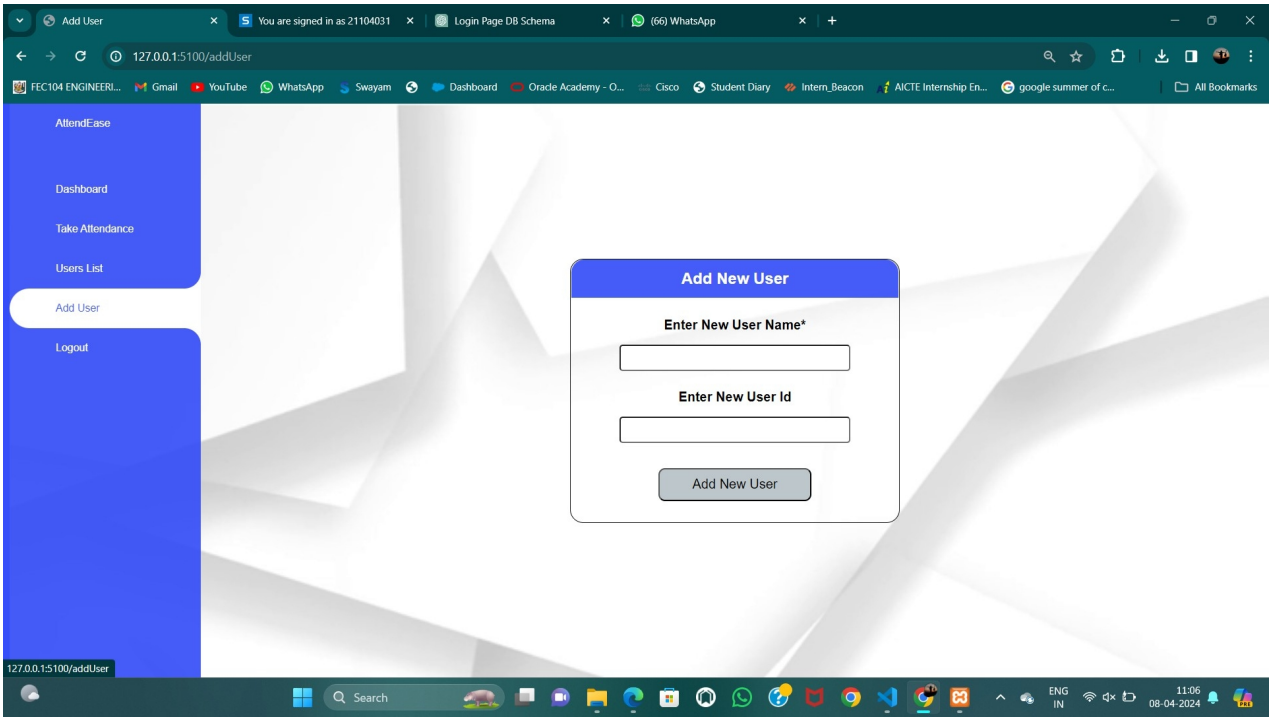


Fig9.3:- Add User Page

Add User Page :- The Page is used to add new users with users Id and user name.

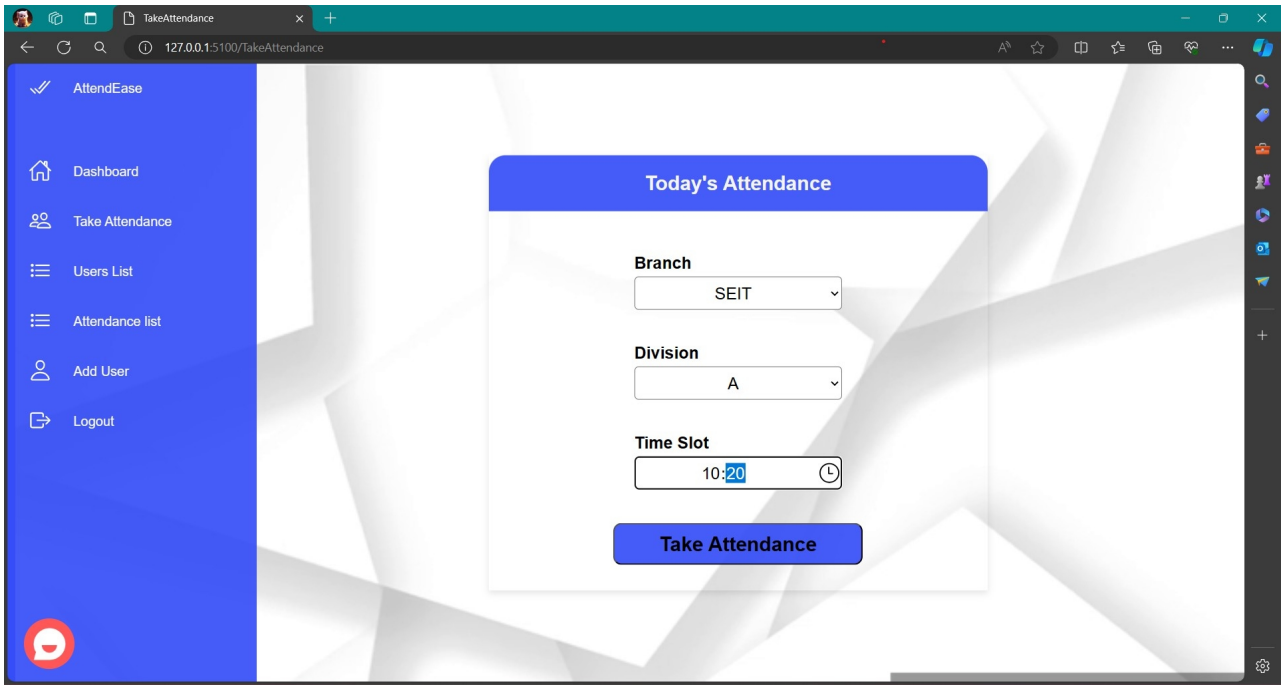


Fig 9.4:- Take Attendance Page

Take Attendance Page:- A "Take Attendance" page is a web interface designed for recording the attendance of individuals in a specific context, such as a classroom, event, or meeting. It typically includes features based on classification like Branch ,Divison , and Time slot

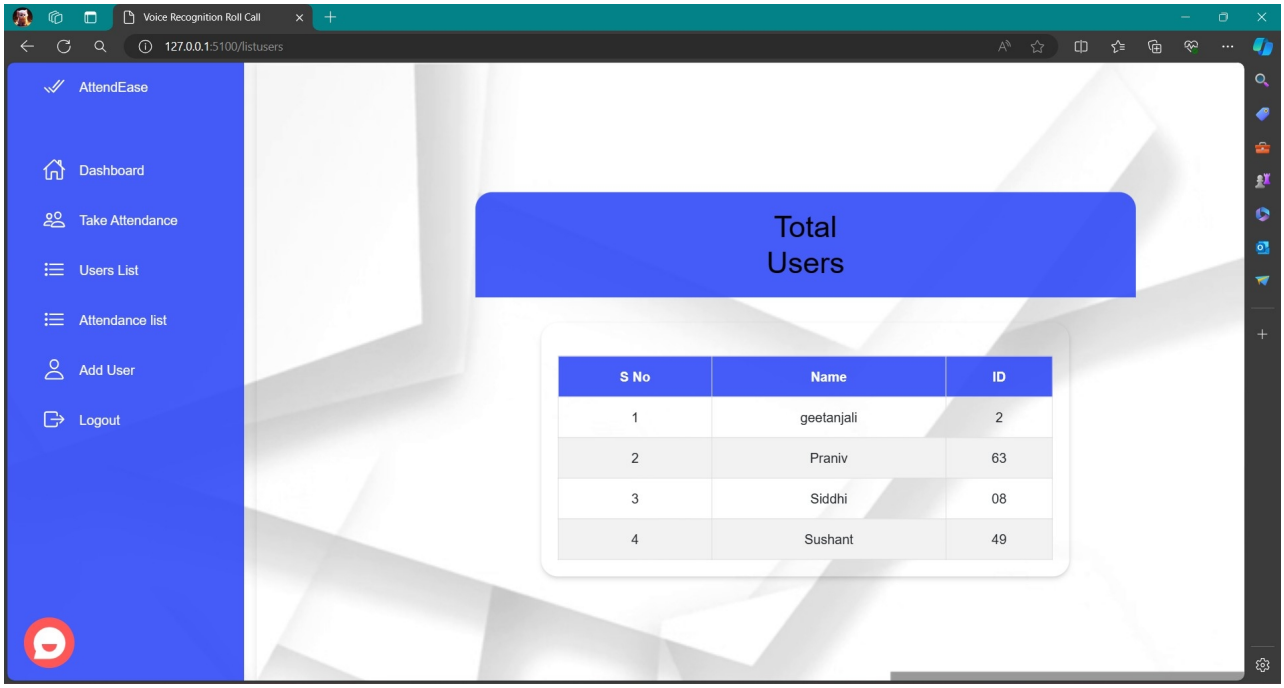


Fig 9.5:- Total User List Page

Total User List Page:- A User List Page is a web interface displaying a list of registered users within a system or application, often including information like usernames,ID.

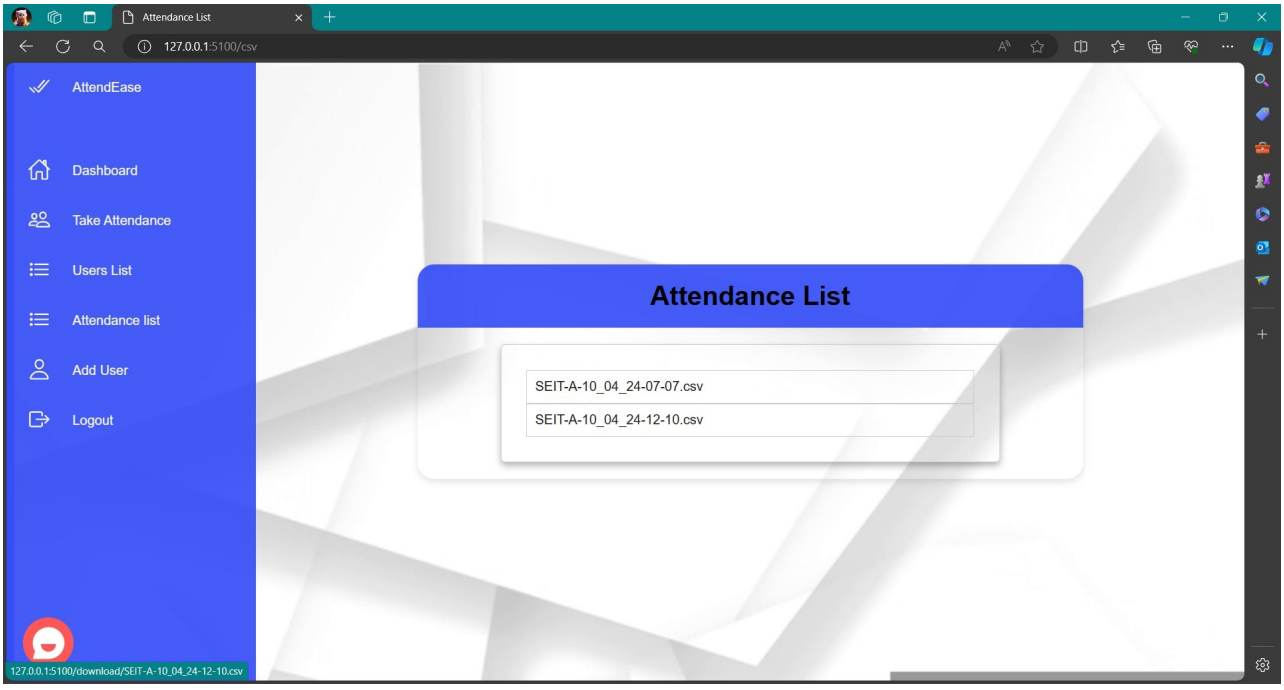


Fig: 9.6:- Attendance List Page

Attendance List Page:- An Attendance List Page where attendance csv list is displayed in csv file list format.

Chapter 10

Conclusion and Future Scopes

In conclusion, the implementation of an ML-based attendance system using face recognition marks a significant advancement in the realm of educational technology. This sophisticated system not only streamlines the attendance tracking process but also enhances accuracy, contributing to a more efficient and transparent academic environment. By harnessing the power of machine learning and computer vision, educational institutions can automate attendance management, reduce administrative burden, and ensure compliance with attendance policies.

Furthermore, the system offers a range of benefits beyond attendance tracking. It can provide valuable insights into student attendance patterns, helping educators identify at-risk students and tailor interventions accordingly. Additionally, it fosters a culture of accountability among students and promotes a sense of ownership over their academic journey.

The implementation of such a system underscores the commitment of educational institutions to embrace innovative technologies and improve the overall learning experience for students. By leveraging ML-based solutions, institutions can stay at the forefront of technological advancements and better prepare students for the demands of the digital age.

10.1 Future Scope:

1. Mobile Accessibility: Developing mobile applications for convenient attendance tracking on smartphones and tablets.
2. Integration with Student Information Systems: Seamless integration with existing student information systems to streamline data management processes.
3. Privacy and Security: Prioritizing data privacy and security by implementing robust encryption and access control measures.
4. Integration with Learning Management Systems: Seamless integration with learning management systems to provide a holistic view of student engagement and performance.

By embracing these future directions, educational institutions can further leverage ML-based attendance systems to create more inclusive, efficient, and data-driven learning environments.
Ultimately, the ongoing evolution of such systems reflects a commitment to innovation and excellence in education.

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