**SNS COLLEGE OF ENGINEERING**



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**FACE RECOGNITION ATTENDANCE SYSTEM**

**PROJECT REPORT**

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**ABSTRACT:**

The Face Recognition Attendance System is an innovative and efficient solution designed to streamline the attendance management process using facial recognition technology. This system utilizes Python's advanced computer vision libraries, such as OpenCV and dlib, to detect and recognize human faces in real-time. The core objective of this system is to provide an automated, accurate, and secure method for recording attendance without the need for manual data entry or traditional paper-based methods.

The proposed system employs a multi-step process that involves face detection, feature extraction, and face recognition algorithms to identify individuals present during an event or class session.

To ensure seamless data management, the system integrates with a database, storing essential attendance records securely. A relational database management system (RDBMS) like MySQL or SQLite can be employed for this purpose. The system can also facilitate an easy-to-use graphical user interface (GUI) where administrators can view, monitor, and manage attendance records conveniently.

**CHAPTER 1**

**1.INTRODUCTION:**

In today's fast-paced world, efficient attendance management plays a crucial role in educational institutions, corporate offices, and event management scenarios. Traditional manual methods of recording attendance are not only time-consuming but also prone to errors, leading to inaccurate data and potential identity fraud. To address these challenges and revolutionize attendance tracking, the Face Recognition Attendance System is proposed. This system harnesses the power of facial recognition technology, Python programming, and database integration to provide an automated, accurate, and secure solution for attendance management.

The Face Recognition Attendance System leverages cutting-edge computer vision techniques, utilizing Python libraries such as OpenCV and dlib, to detect and recognize human faces in real-time. The system employs pre-trained deep learning models, such as Convolutional Neural Networks (CNNs), to extract intricate facial features, ensuring robust and reliable identification even in varying lighting conditions and facial expressions.

The core objective of this project is to replace the laborious and error-prone manual attendance tracking methods with an automated system that is not only efficient but also highly accurate. By leveraging the biometric authentication capabilities of facial recognition, the system mitigates the risk of proxy attendance and identity fraud, bolstering the overall security and integrity of attendance records.

The integration of a database management system, such as MySQL or SQLite, allows for seamless storage and retrieval of attendance records. This database integration facilitates easy access to historical attendance data and provides administrators with a comprehensive overview of attendance trends and patterns.

The user-friendly graphical user interface (GUI) of the Face Recognition Attendance System empowers administrators to effortlessly monitor and manage attendance records, significantly reducing the administrative burden. Moreover, the system can be easily scaled to cater to the diverse needs of various organizations, making it a versatile solution suitable for educational institutions of all sizes, corporate environments, and events with different attendance scales.

In conclusion, the Face Recognition Attendance System holds the promise of transforming attendance management practices across multiple domains. By harnessing the potential of Python, facial recognition technology, and database integration, this system ensures accuracy, efficiency, and security, empowering educators, HR personnel, and event organizers to streamline attendance tracking and allocate their time and resources more effectively. With its potential to revolutionize attendance management, this project stands as a significant step towards optimizing and modernizing attendance recording processes.

* 1. **PROBLEM STATEMENT:**

The current attendance management systems suffer from drawbacks such as manual data entry errors, time-consuming processes, and susceptibility to proxy attendance. These inefficiencies hamper the overall productivity and accuracy of attendance tracking, causing frustration for administrators and educators alike. The problem at hand is to develop a Face Recognition Attendance System that leverages Python and database integration to overcome these challenges, ensuring a seamless, accurate, and secure method of recording attendance. The solution must be user-friendly, scalable, and capable of handling real-world scenarios in educational institutions, corporate offices, and event environments.

* 1. **EMPATHY:**

Attendance management has long been a labor-intensive and error-prone task, causing frustration among teachers, HR personnel, and event organizers. Manual attendance tracking often leads to inaccuracies, proxy attendance, and consumes valuable time that could be utilized for more meaningful activities. The Face Recognition Attendance System empathizes with the challenges faced by administrators and educators in anaging attendance records and strives to alleviate their burden by offering an automated and reliable solution.

* 1. **OBJECTIVES OF THE PROJECT:**

The main objective of the Face Recognition Attendance System is to develop an automated and efficient solution for recording attendance using facial recognition technology. The system aims to replace traditional manual methods of attendance tracking with a more accurate, secure, and time-saving approach. By leveraging Python and database integration, the project seeks to provide a user-friendly interface that can be easily implemented in educational institutions, corporate environments, and events to streamline attendance management processes.

* 1. **SCOPE OF THE PROJECT:**

Face Detection: Implementing advanced computer vision techniques to detect human faces in real-time, ensuring accurate identification of individuals.

Facial Recognition: Utilizing deep learning models to extract facial features and recognize individuals, allowing for precise and consistent attendance recording.

Database Integration: Integrating with a relational database management system to securely store attendance records for easy access and management.

**CHAPTER 2**

**EXISTING SYSTEM:**

Existing System for Attendance Management:

The existing system for attendance management typically relies on manual methods or legacy software that involves human intervention to record attendance data. Some common features and limitations of the traditional attendance management systems include:

1. Paper-Based Registers: In many educational institutions and small-scale organizations, attendance is still recorded manually using paper-based registers. Students or employees physically sign their names or IDs to indicate their presence.

2. Card-Based Systems: Some organizations use proximity cards or RFID tags that employees or students need to swipe or tap on a card reader to mark their attendance.

3. Biometric Systems: Some advanced systems employ fingerprint or iris scanning to verify identity and record attendance.

4. Excel Sheets: In some cases, attendance data is recorded in Excel sheets manually, which can be time-consuming and prone to errors.

Limitations of the Existing System:

1. Time-Consuming: Manual attendance tracking methods are time-consuming, especially in large organizations or events with a high number of attendees.

2. Error-Prone: Paper-based systems and manual data entry can lead to inaccuracies, duplicate entries, and incomplete records.

3. Proxy Attendance: The existing systems may not be able to prevent proxy attendance, where one person marks attendance on behalf of another.

4. Lack of Real-Time Monitoring: Traditional methods may not allow real-time monitoring and analysis of attendance data.

5. Limited Security: Some card-based systems can be vulnerable to card sharing or misuse.

6. Data Management Challenges: Excel sheets or manual records can be challenging to manage and organize, especially when dealing with extensive historical data.

Due to these limitations, there is a clear need for an advanced, automated, and more reliable attendance management system that leverages modern technologies like facial recognition, Python programming, and database integration. The proposed Face Recognition Attendance System aims to overcome these challenges and provide an innovative solution for accurate, efficient, and secure attendance tracking.

**CHAPTER 3**

**SYSTEM REQUIREMENTS:**

Operating System: Windows, macOS, or Linux operating system.

Python: Install the latest version of Python (e.g., Python 3.7 or higher) to run the application and leverage its libraries.

Python Libraries: Install the following Python libraries:

1. OpenCV: For face detection and image processing.
2. dlib: For facial feature extraction and facial recognition.
3. NumPy: For numerical operations and array manipulation.
4. Pandas: For data handling and storage.
5. Flask (Optional): For developing a web-based GUI
6. MySQL Connector (Optional): For integrating with a MySQL database.
7. Database Management System (DBMS): Choose a suitable DBMS like MySQL or SQLite for storing attendance records securely.\

**HARDWARE REQUIREMENTS:**

CPU: Quad-core processor or higher for real-time face recognition.

GPU (Optional): A dedicated GPU (e.g., NVIDIA CUDA-enabled GPU) can significantly enhance the processing speed for deep learning-based facial recognition algorithms.

RAM: Minimum 8 GB RAM to handle face recognition tasks efficiently.

Camera: A high-resolution camera capable of capturing clear facial images in various lighting conditions.

Storage: Adequate storage space to store the application code, pre-trained models, and attendance data.

Internet Connectivity (Optional): Required for cloud-based services or remote data storage.

**CHAPTER 4**

**IDEATE AND PROPOSED WORK:**

1. Data Collection and Pre-processing:

- Gather a diverse dataset of facial images representing individuals who will be attending the events or classes.

- Pre-process the images to ensure uniform size, lighting normalization, and alignment for accurate feature extraction.

2. Face Detection and Recognition Model Selection:

- Choose a suitable face detection algorithm to identify faces in real-time or images.

4. Database Design and Integration:

- Design a database schema to store attendance records, including user information and timestamps.

- Integrate the face recognition system with a relational database management system (e.g., MySQL) for secure storage of attendance data.

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**CHAPTER 5**

**CODING:**

**PYTHON LIBRARIES:**

import cv2

import numpy as np

import face\_recognition

import os

from datetime import datetime

import cv2

import dlib

**MYSQL DATABASE:**

import cv2

import numpy as np

import face\_recognition

import os

from datetime import datetime

import mysql.connector

# Initialize MySQL connection

db\_connection = mysql.connector.connect(

    host="localhost",

    user="sem2",

    password="mysql2004",

    database="attendance\_db"

)

db\_cursor = db\_connection.cursor()

# Create attendance table (if it doesn't exist)

create\_table\_query = """

CREATE TABLE IF NOT EXISTS attendance (

    id INT AUTO\_INCREMENT PRIMARY KEY,

    name VARCHAR(255) NOT NULL,

    date DATETIME NOT NULL

)

"""

db\_cursor.execute(create\_table\_query)

# ... (your code for video capture and face recognition)

while True:

    # ... (your loop code for face recognition)

    # Insert attendance records into the database

    for name in attendance:

        insert\_query = "INSERT INTO attendance (name, date) VALUES (%s, %s)"

        data = (name, datetime.now())

        db\_cursor.execute(insert\_query, data)

        db\_connection.commit()

    # ... (your code to display results and exit loop)

# Close MySQL connection

db\_cursor.close()

db\_connection.close()

cv2.destroyAllWindows()

**LOAD KNOWN FACES:**

known\_faces\_dir = "known\_faces"

known\_faces = []

known\_names = []

for name in os.listdir(known\_faces\_dir):

    image\_path = os.path.join(known\_faces\_dir, name)

    image = face\_recognition.load\_image\_file(image\_path)

    encoding = face\_recognition.face\_encodings(image)[0]

    known\_faces.append(encoding)

    known\_names.append(os.path.splitext(name)[0])

**INITIALIZE VARIABLES:**

face\_locations = []

face\_encodings = []

face\_names = []

attendance = []

**VIDEO CAPTURE:**

cap = cv2.VideoCapture(0)

while True:

    ret, frame = cap.read()

    small\_frame = cv2.resize(frame, (0, 0), fx=0.25, fy=0.25)

    rgb\_small\_frame = small\_frame[:, :, ::-1]

    face\_locations = face\_recognition.face\_locations(rgb\_small\_frame)

    face\_encodings = face\_recognition.face\_encodings(rgb\_small\_frame, face\_locations)

    face\_names = []

    for face\_encoding in face\_encodings:

        matches = face\_recognition.compare\_faces(known\_faces, face\_encoding)

        name = "Unknown"

        face\_distances = face\_recognition.face\_distance(known\_faces, face\_encoding)

        best\_match\_index = np.argmin(face\_distances)

        if matches[best\_match\_index]:

            name = known\_names[best\_match\_index]

            if name not in attendance:

                attendance.append(name)

        face\_names.append(name)

    for (top, right, bottom, left), name in zip(face\_locations, face\_names):

        top \*= 4

        right \*= 4

        bottom \*= 4

        left \*= 4

        cv2.rectangle(frame, (left, top), (right, bottom), (0, 0, 255), 2)

        cv2.rectangle(frame, (left, bottom - 35), (right, bottom), (0, 0, 255), cv2.FILLED)

        font = cv2.FONT\_HERSHEY\_DUPLEX

        cv2.putText(frame, name, (left + 6, bottom - 6), font, 0.7, (255, 255, 255), 1)

    cv2.imshow('Video', frame)

    if cv2.waitKey(1) & 0xFF == ord('q'):

        break

**SAVE ATTENDANCE TO FILE:**

with open('attendance.txt', 'w') as file:

    file.write("Attendance:\n")

    for name in attendance:

        file.write(name + "\n")

cap.release()

cv2.destroyAllWindows()

**CHAPTER 6**

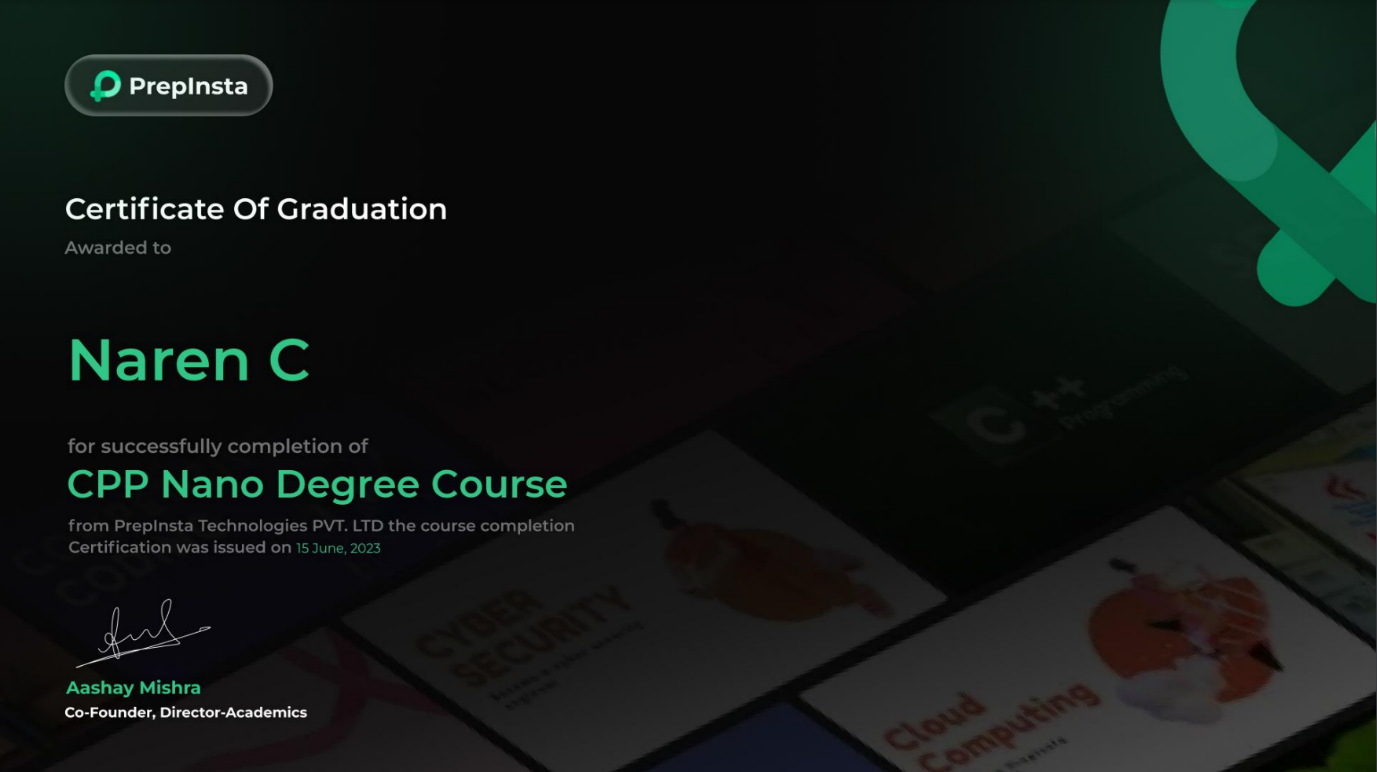
**CONCLUSION:**

The Face Recognition Attendance System presented in this proposal offers a promising solution to modernize and streamline attendance management across various domains. By leveraging advanced facial recognition technology, Python programming, and database integration, the system aims to revolutionize the way attendance is recorded, managed, and analyzed.

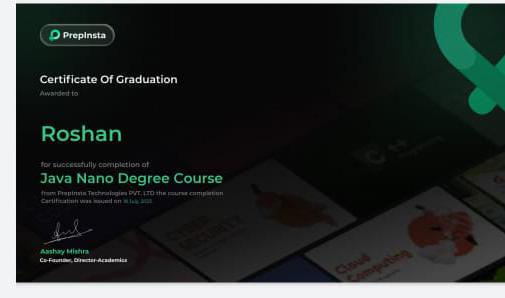
Through the utilization of deep learning-based models, the proposed system can accurately detect and recognize human faces in real-time, even under varying lighting conditions and facial expressions. This ensures high accuracy and minimizes the risk of false positives or negatives, addressing the limitations of traditional manual attendance tracking methods. The integration with a robust database management system allows for secure and efficient storage of attendance records, enabling easy access and retrieval of historical data. A user-friendly graphical interface empowers administrators to conveniently monitor attendance, generate reports, and make data-driven decisions.

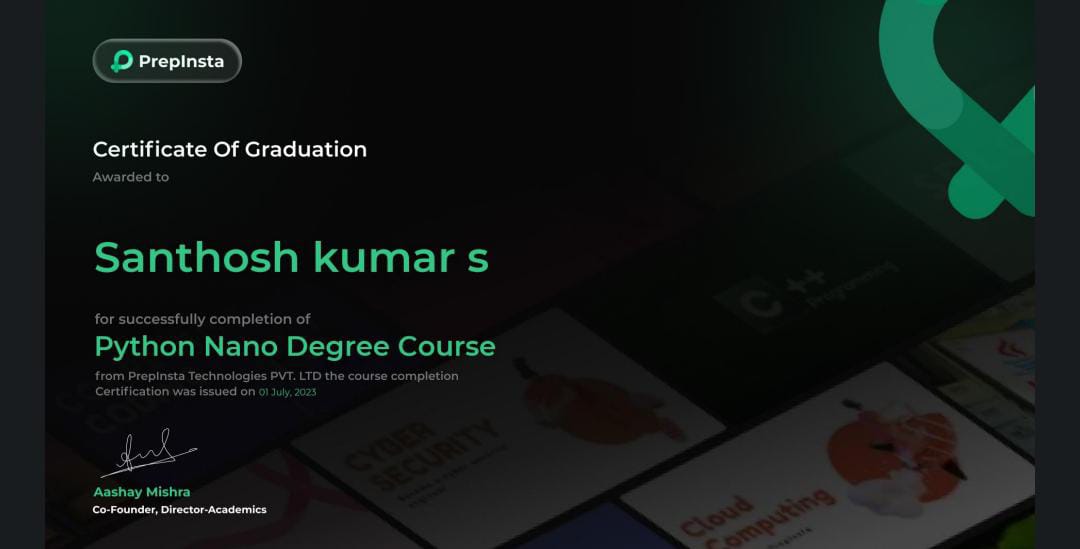
In conclusion, the Face Recognition Attendance System stands as an innovative and efficient solution that promises to enhance attendance management practices and optimize resources. By automating the attendance tracking process, the system not only saves time and effort but also contributes to increased accuracy, transparency, and overall productivity. As advancements in facial recognition technology and deep learning continue to progress, the system holds the potential to further evolve and provide even more sophisticated and seamless attendance management solutions for a wide range of applications.

**CERTIFICATES**

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