Attendance using facial recognition

### Project Proposal

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# Abstract

The system utilizes a webcam for real-time image capture and processing, and machine learning-based software application that enables automatic recording of attendance using facial recognition technology. The project aims to eliminate the manual process of taking attendance, which can be time-consuming, prone to errors, and requires a significant amount of human resources. The proposed solution will automate the process and make it more efficient, accurate, and reliable.

# Introduction

I am excited to present my proposal for the development of an attendance system using facial recognition technology. The system is designed to provide a convenient and accurate way of tracking attendance for various settings, including schools, offices, and events.

For this project, I propose to use Python as the programming language and the FACE RECOGNITION[[1]](#_11._References) library for face recognition and manipulation. This library is a powerful tool that allows developers to detect and recognize faces in images and manipulate them using a variety of techniques.

The **FACE RECOGNITION**[**[1]**](#_11._References) library is built on top of dlib's state-of-the-art face recognition technology, which is based on deep learning. This model has an accuracy rate of 99.38% on the Labeled Faces, making it one of the most accurate face recognition tools available today.

Using this technology, the attendance system will be able to detect and recognize faces in real-time, and mark attendance in an Excel file with a timestamp. This system is designed to be user-friendly and can be easily integrated into existing workflows.

Overall, the attendance system using facial recognition is a powerful and innovative solution that can improve attendance tracking and management for various organizations. I look forward to discussing and take guideance from you.

# Objective

Here are the objectives for the attendance system using facial recognition:

* Develop a robust attendance system using facial recognition technology that can accurately detect and recognize faces in real-time.
* Implement an Excel file to store attendance data, including the date, time, and name of the person, for easy retrieval and analysis.
* Eliminate the need for manual attendance tracking, reducing the time and effort required for attendance management.
* Monitor the attendance system's performance regularly.
* Provide a more accurate and reliable way of tracking attendance, reducing errors and potential fraud.
* Save costs associated with traditional attendance tracking methods, such as paper-based systems.

# Related System Analysis/Literature Review

To solve the problem of attendance tracking, various solutions are already present in the market. Some of the most popular solutions include:

* Biometric Attendance Systems
* RFID-based Attendance Systems
* Manual Attendance Tracking

The problem of attendance tracking has been addressed by several existing solutions, including traditional manual attendance systems and automated attendance systems using biometric technology such as fingerprint or iris recognition. However, these systems have their disadvantages and limitations.

Traditional manual attendance systems require the physical presence of an instructor or supervisor to take attendance manually, which is time-consuming and can be prone to errors.

Fingerprint recognition systems can be affected by factors such as dirt or moisture on the finger, which can affect the accuracy of the system. In addition, some individuals may have difficulty using fingerprint or iris recognition systems due to physical disabilities or injuries.

Facial recognition technology has also been used in attendance systems, which utilizes machine learning algorithms to recognize and identify individuals based on facial features. This technology has the advantage of being contactless, which is especially important during the COVID-19[[3]](#_11._References) pandemic. However, facial recognition technology also has its own set of limitations and concerns, including privacy and security concerns, as well as accuracy issues.

In terms of research, there have been several studies on the use of facial recognition technology for attendance tracking. A study published in the International Journal of Computer Applications in 2018 proposed an attendance management system that uses facial recognition technology. The system uses Haar-like features and Local Binary Pattern (LBP) histogram features for facial recognition. The system was found to be accurate and efficient, with an accuracy rate of 92.7.

# Problem Statement

The problem statement for the attendance system using facial recognition is the inefficiency and inaccuracies associated with traditional attendance tracking methods. Manual attendance tracking can be time-consuming and prone to errors, while time clock systems can be easily manipulated or have technical issues. Additionally, traditional attendance tracking methods may not provide real-time data and analytics, making it difficult to identify attendance patterns and trends. These inefficiencies can lead to increased costs, reduced productivity, and potential inaccuracies in attendance records. The proposed solution of a facial recognition attendance system aims to address these issues by providing a more accurate, efficient, and secure way of tracking attendance, improving attendance management and data analytics, and reducing costs associated with traditional attendance tracking methods.

# Proposed Methodology/Architecture

The proposed methodology for the attendance system using facial recognition involves the following steps:

1. Research and planning: Conduct research on facial recognition technology, Python programming language, and the FACE RECOGNITION library to determine the most appropriate technology and methodology for the project. Develop a plan and timeline for the project.
2. Data collection and preprocessing: Collect a dataset of facial images of all the students in class or staff. Preprocess the data by cleaning and preparing the images for training the facial recognition model.
3. Model training and testing: Train the facial recognition model using the collected dataset and the FACE RECOGNITION library. Test the model's accuracy and reliability using a variety of test cases and datasets.
4. System development: Develop the attendance system using Python programming language and the FACE RECOGNITION library. Implement the system's features, such as real-time face detection, recognition, and marking attendance in an Excel file with timestamps.
5. User interface development: Develop a user-friendly interface for the attendance system, allowing users to view that their attendance is marked.
6. Testing and optimization: Conduct testing to ensure the accuracy and reliability of the attendance system, minimizing errors and false positives. Optimize the system's performance using analytics and user feedback.
7. Deployment and support: Deploy the attendance system to the target environment, providing support and maintenance for the system to ensure that it remains up-to-date and functional over time.

The proposed methodology aims to develop a robust, accurate, and user-friendly attendance system using facial recognition technology that can improve attendance management and data analytics and reduce costs associated with traditional attendance tracking methods.

# Project Scope

The project scope for the attendance system using facial recognition includes the following:

Design and development of a facial recognition attendance system using Python [[4]](#_11._References)programming language and the FACE RECOGNITION library.

Integration of real-time face detection and recognition algorithms with the attendance system, allowing users to mark attendance by standing in front of a webcam.

Integration of the attendance system with an Excel file to track attendance records with timestamps.

Development of a user-friendly interface for the attendance system, allowing users to view attendance data, generate reports, and manage attendance records.

Implementation of security measures to protect user data, including facial images and attendance records.

Testing of the attendance system to ensure accuracy and reliability, minimizing errors and false positives.

Optimization of the attendance system's performance using analytics and user feedback.

The project scope does not include the development of additional hardware components beyond a webcam, which can be easily integrated with the attendance system. The scope also does not include the development of additional software components beyond the facial recognition attendance system and the user interface, although the attendance data can be exported to other software tools for further analysis and reporting.

# Solution Application Areas

Educational Institutions: Schools, colleges, and universities are potential customers who would require an attendance system using facial recognition. According to the Pakistan Education Statistics Report[[2]](#_11._References) 2019-2020, there were 50.5 million students enrolled in pre-primary, primary, middle, and high schools in Pakistan in 2019-2020. Additionally, there were approximately 3.9 million students enrolled in colleges and universities in Pakistan in 2020. This represents a large potential market for the attendance system using facial recognition in Pakistan.

Corporate Offices: Corporate offices are another potential customer segment for the attendance system using facial recognition. According to the Pakistan Bureau of Statistics[[4]](#_11._References), there were approximately 2.2 million employed persons in the private sector in Pakistan in 2020. This represents a significant potential market for the attendance system using facial recognition in corporate offices in Pakistan.

Healthcare Facilities: Healthcare facilities, such as hospitals and clinics, can also be potential customers for the attendance system using facial recognition. According to the Pakistan Bureau of Statistics[[4]](#_11._References), there were approximately 1,282 hospitals and 6,263 basic health units (BHUs) and rural health centers (RHCs) in Pakistan in 2019. Additionally, there were approximately 197,000 physicians and 145,000 nurses in Pakistan in 2020. This represents a substantial potential market for the attendance system using facial recognition in healthcare facilities in Pakistan.

Government Agencies: Government agencies, such as federal, provincial, and local governments, can also be potential customers for the attendance system using facial recognition. According to the Pakistan Bureau of Statistics[[4]](#_11._References), there were approximately 4.7 million federal and provincial government employees in Pakistan in 2020. This represents a considerable potential market for the attendance system using facial recognition in government agencies in Pakistan.

Overall, the potential market size for the attendance system using facial recognition in Pakistan can be substantial, considering the large number of potential customers in various sectors and industries.

# Tools/Technology

For the implementation of the attendance system using facial recognition, we will use the following tools and technologies:

Python: We will use the Python programming language for developing the software application. Python provides a rich set of libraries and frameworks that can be used for various tasks, including image processing, machine learning, and data manipulation.

Face Recognition Library: We will use the Face Recognition library, which is a Python library that provides face recognition capabilities using deep learning models. This library is built using dlib's state-of-the-art face recognition built with deep learning, which has an accuracy of 99.38% on the Labeled Faces in the Wild benchmark.

OpenCV: We will use OpenCV, an open-source computer vision library, for face detection and image processing tasks. OpenCV provides various functions for image and video analysis, including face detection and feature extraction.

Excel: We will use Excel for storing and managing attendance data. The attendance system will mark attendance in an Excel file with the timestamp, which can be used for further analysis and reporting.

Webcam: We will use a webcam to capture the images of the individuals and recognize their faces using the Face Recognition library.

Overall, these tools and technologies will enable us to develop an efficient and accurate attendance system using facial recognition.

# Team Members Individual Tasks/Work Division

1. Member Name: **Salman Masood**

Task:**Planning and project management**

He will be responsible for creating a detailed project plan, setting timelines, and monitoring progress.

1. Member Name: **Umer Aslam**

Task: **Design**

Focus on designing the system architecture, creating user interface, and defining the data models.

1. Member Name: **Ibrar** **Ahmad**

Task:**Development**

He will take care of the actual coding, building, and testing of the system.

However,these roles are not fixed, and each person should be able to contribute in all areas as needed.

# 11. References

* <https://www.finance.gov.pk/survey/chapter_22/PES10-EDUCATION.pdf>
* <https://pypi.org/project/face-recognition/>
* <https://en.wikipedia.org/wiki/COVID-19>
* <https://www.python.org/>
* <http://www.pbs.gov.pk/>