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ATTENDANCE SYSTEM USING FACE RECOGNITION TECHNIQUES

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Abstract

If attendance is managed by hand, it might be a significant strain for the teachers. A clever and automated attendance management system is being used to overcome this problem. However, in this system, authentication is a critical concern. Biometrics are commonly used to implement smart attendance systems. One of the biometric approaches for improving this system is face recognition. Facial recognition, as a key aspect of biometric verification, is widely employed in a variety of applications, including video surveillance and CCTV systems, computer-human interaction, indoor access systems, and network security. The problem of proxies and students being marked present even when they are not physically there can be easily solved with this architecture. Face detection and recognition are the two most important implementation steps in this type of system. Using Eigen face values, Principle Component Analysis (PCA), and Convolutional Neural Networks, this study provides a model for constructing an automated attendance management system for students in a class (CNN). Following that, a link of recognized faces should be possible by comparing them to a database of student faces. This strategy will be a successful method of managing student attendance and records.

Keywords: Python, Face Detection, Face Extraction, Face Recognition, Attendance Marking

Introduction

This is an ATTENDANCE SYSTEM WITH FACE RECOGNIZATION TECHNIQUES project. The idea and motivation, research objectives, project scope, project contributions, and project background information will all be described in depth in this project. To ensure that the student attendance record is accurate, the personnel staff should have a system in place for approving and maintaining the attendance record on a consistent basis. In general, two types of student attendance frameworks exist: The Manual Attendance System (MAS) and the Automated Attendance System (AAS) (AAS). In practice, MAS personnel may find it impossible to approve and maintain every student's record in a classroom at all times. Marking attendance physically and cumulatively in a classroom with a high teacher-to-student ratio becomes a tiresome and time-consuming task to take each student's attendance As a result, we can put in place a workable framework that will automatically mark students' attendance using facial recognition. AAS may reduce its staff's managerial responsibilities. For example, in an attendance system that uses Human Face Recognition (HFR), the students' face images are often taken when they enter the classroom or when everyone is sitting in the classroom to mark attendance.

The feature-based technique and the brightness-based methodology are the two most commonly used methodologies to deal with HFR. The feature-based methodology makes use of major point features on the face, known as landmarks, such as the eyes, nose, mouth, edges, and other distinguishing

characteristics. As a result, only a portion of the previously extricated picture is covered throughout the calculating procedure. The brightness-based methodology, on the other hand, combines and computes all aspects of a given image. It's also known as image-based or holistic technique. Because the entire picture must be taken into account, the brightness-based methodology takes longer to process and is also more sophisticated.

Various advancements are made during the development of this face recognition framework, but the most important steps are face detection and recognition. To begin, pictures of pupils' faces will be necessary to record attendance. This image can be captured using a camera that will be placed in the classroom in a location that allows the entire classroom to be seen. This image will be used as a source of data for the system. For accurate face recognition, the image should be enhanced with image processing techniques such as grayscale conversion and histogram equalization. The image will be sent via face detection after it has been improved in quality. Face recognition comes after the face identification process. Face identification can be accomplished using a variety of methods, including Eigen face, PCA, and the LDA hybrid algorithm. When faces are recognized in the Eigen face, they are cut from the image. Different facial highlights are retrieved with the help of the element extractor. The student is identified using these faces as Eigen characteristics, and their attendance is recorded by coordinating with the face database. The face database must be built with the final objective of comparison in mind.

Frameworks and Technologies Used

In this section, we will refer to the technologies used for this project. These are the modern technologies commonly used around the globe to develop high-level web applications. Below are the technologies that power this project.

- **Tkinter**
  This framework makes it simpler for Python programmers to develop GUI elements by using Tk toolkit's widgets. In a Python application, Tk widgets can be used to create buttons, menus, data fields, and so forth. These graphical elements can be linked to or interact with features, functionality, methods, data, and even other widgets once they've been developed. A button widget, for example, can accept mouse clicks and be programmed to do a certain action, such as quitting the application.

- **OpenCV**
  Gary Bradsky founded OpenCV while working at Intel. OpenCV offers a growing number of methods in the fields of computer vision and machine learning. OpenCV is a cross-platform library that may be used to create real-time computer vision apps. It primarily focuses on image processing, video capture, and analysis, with features such as face detection and object detection thrown in for good measure.
- **Numpy**
  NumPy is a Python array library. It also provides functions for working with matrices, fourier transforms, and the domain of linear algebra. Travis Oliphant established NumPy in 2005. You can use it for freely because it is an open source project. Numerical Python is abbreviated as NumPy.

Why Use NumPy?

Lists are similar to arrays in Python, although they are slower to process. NumPy intends to provide a quicker array object than typical Python lists, up to 50 times faster. NumPy's array object is named ndarray, and it comes with a slew of helper functions to make working with it a breeze. In data research, when speed and resources are essential, arrays are widely employed.

- **Pandas**

  Pandas is a Python library that provides quick, versatile, and expressive data structures that make working with "relational" or "labelled" data simple and intuitive. It aspires to be the most basic high-level building block for performing realistic, real-world data analysis in Python. It also aspires to be the most powerful and versatile open source data analysis and manipulation tool available in any language. Pandas' two core data structures, Series (1-dimensional) and DataFrame (2-dimensional), are capable of handling the vast majority of common use cases in finance, statistics, social science, and many fields of engineering. frame offers a lot more than that. Pandas is based on NumPy and is designed to work nicely with a variety of other third-party libraries in a scientific computing environment. Many of these principles are in place to solve issues that arise when working with different languages or scientific research environments. Working with data is often divided into several stages for data scientists: munging and cleaning data, analysing and modelling it, and finally putting the results of the analysis into a format appropriate for plotting or tabular display.

- **Pathlib**

  The Pathlib module in Python contains several classes that describe file system paths and have semantics that are acceptable for various operating systems. This module is classified as a standard Python utility module.

  Pure and concrete pathways are the two types of path classes in the Pathlib module. Pure pathways only support computational operations and do not support I/O, whereas concrete paths derive from pure paths and support both computational and I/O activities.

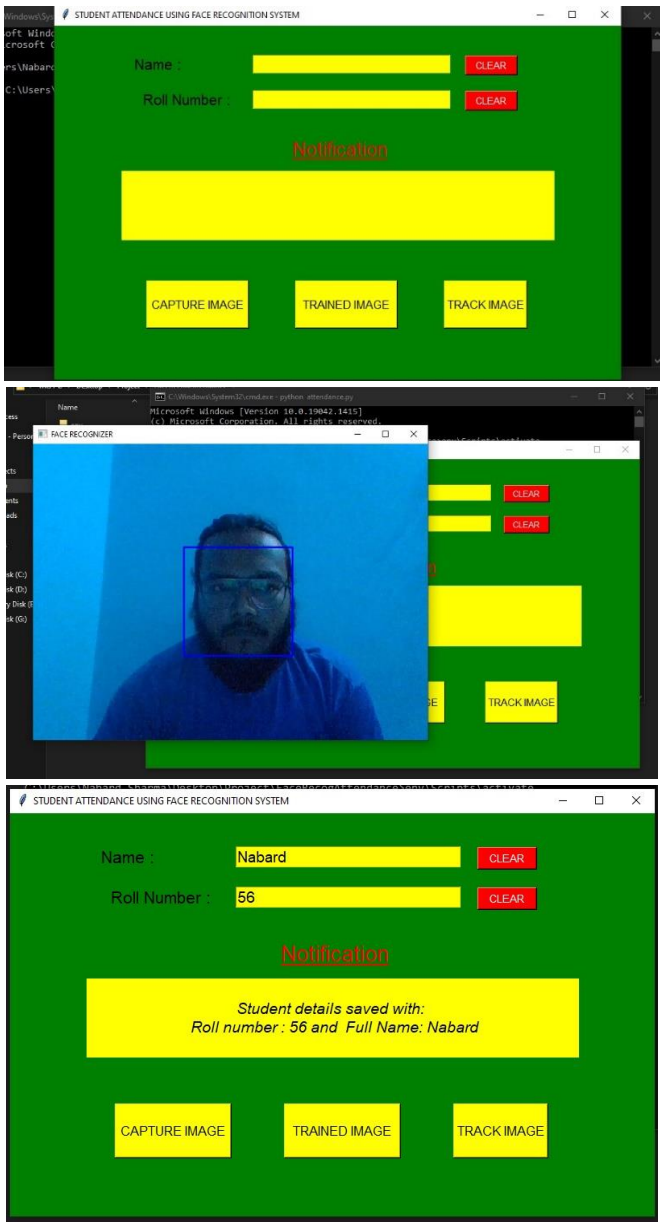
- **HaarCascade**

  Haar Cascade is a machine learning-based method for training a classifier that uses a large number of positive and negative pictures. Positive images contain the images that we want our classifier to recognise. Negative Images - Images of anything that isn't the object we're looking for. It is an Object Detection Algorithm that is used to recognise faces in images and real-time videos. In their research work "Rapid Object Detection using a Boosted Cascade of Simple Features," Viola and Jones suggest edge or line detection features. To train on, the algorithm is given a large number of positive photos with faces and a large number of negative images without faces. The use of integral pictures speeds up the computation of Haar-like features, which is one of the advantages of the Haar cascade (also called summed area tables). Using the AdaBoost algorithm, they are also incredibly efficient at feature selection.

SYSTEM DESIGN AND IMPLEMENTATION

Firstly, the student has to register their Name along with their ID Numbers and Capture the Image. So that their name and id is stored in the database along with their image so that it helps them to get their attendance. Then they have to train a image so that the classifier we are using i.e haarcascade can identify the image with positive and negative and show the image. Once the date is stored in the database. The student can use the track image option to get their attendance. The attendance is marked with name and id along with date and time in an Excel Sheet.

Capture Image with Name and Id Number



Train Image

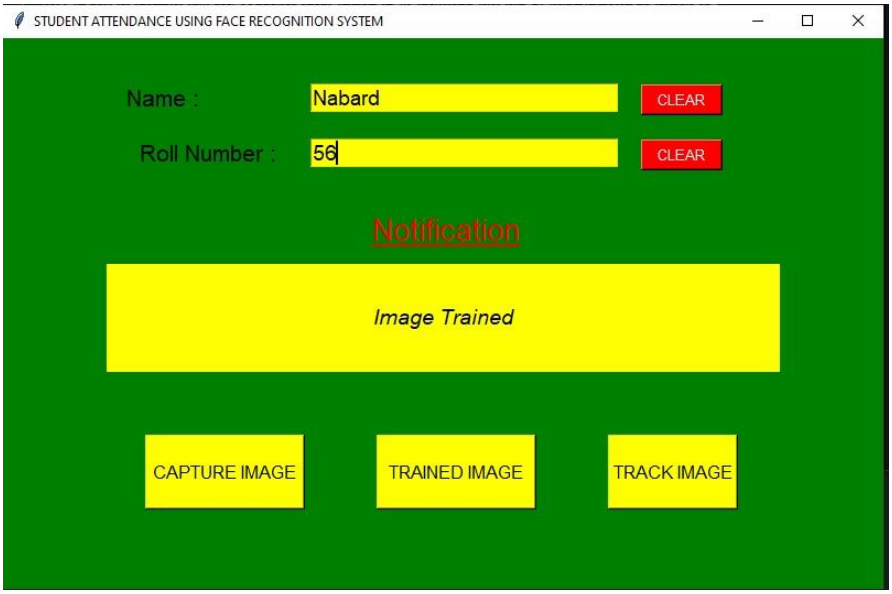
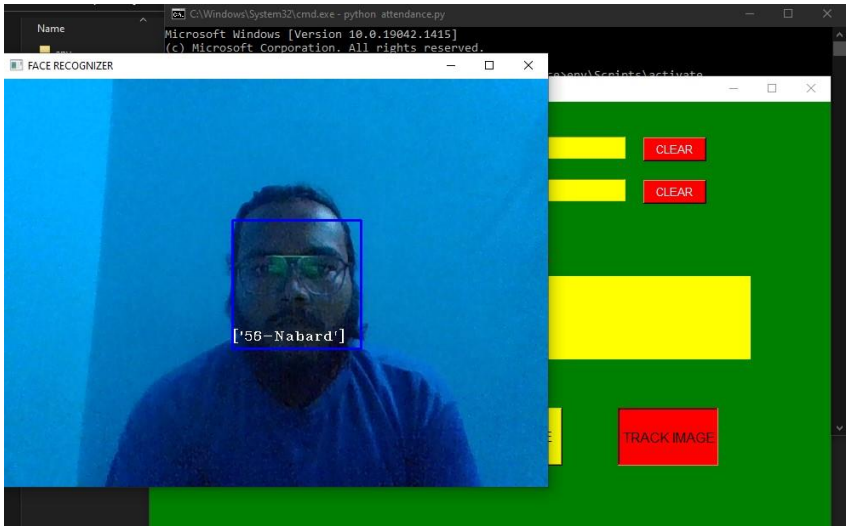


Image Tracking and Attendance Marking



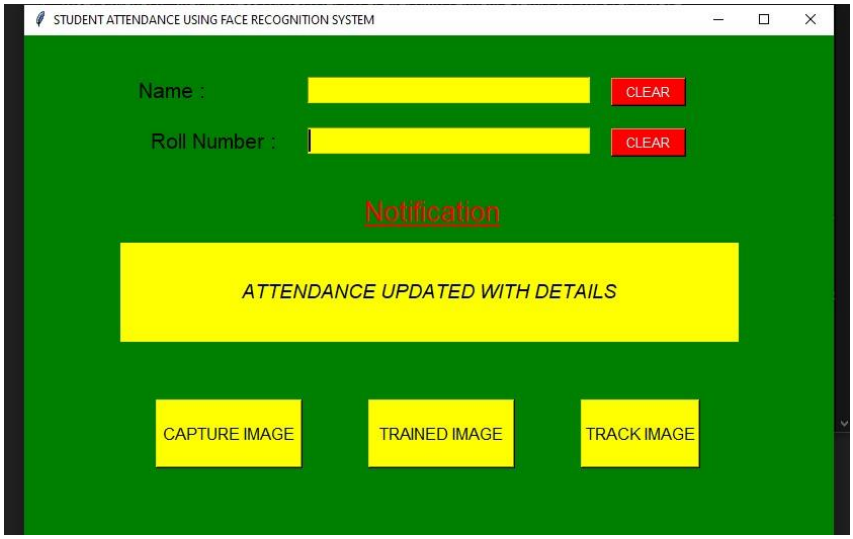
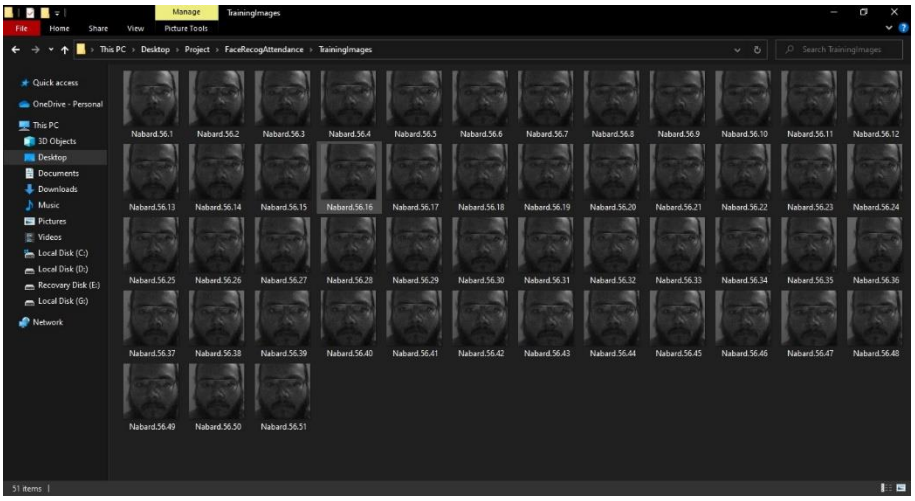
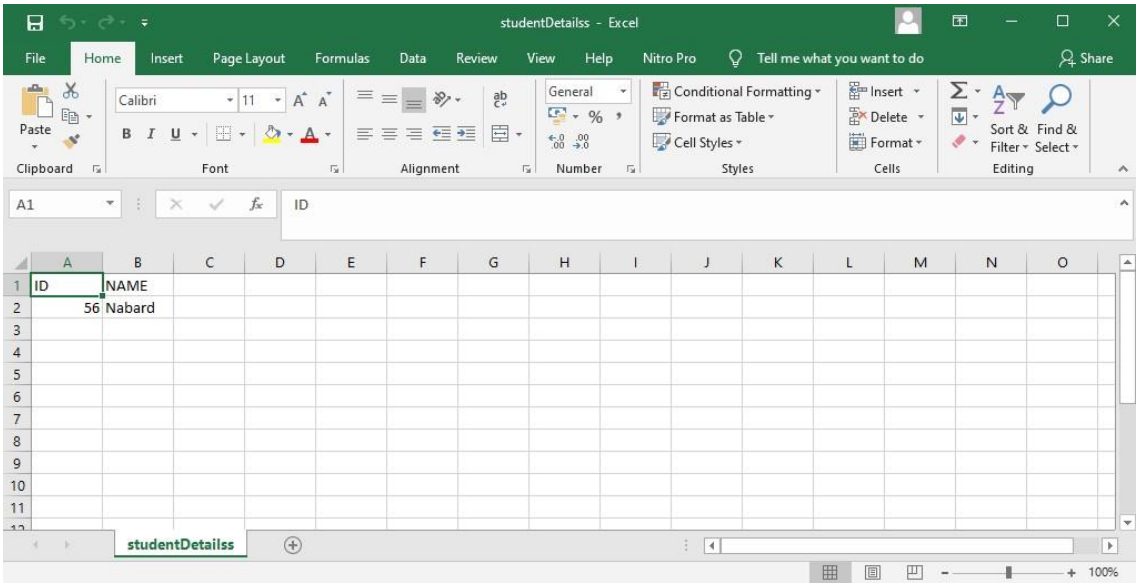


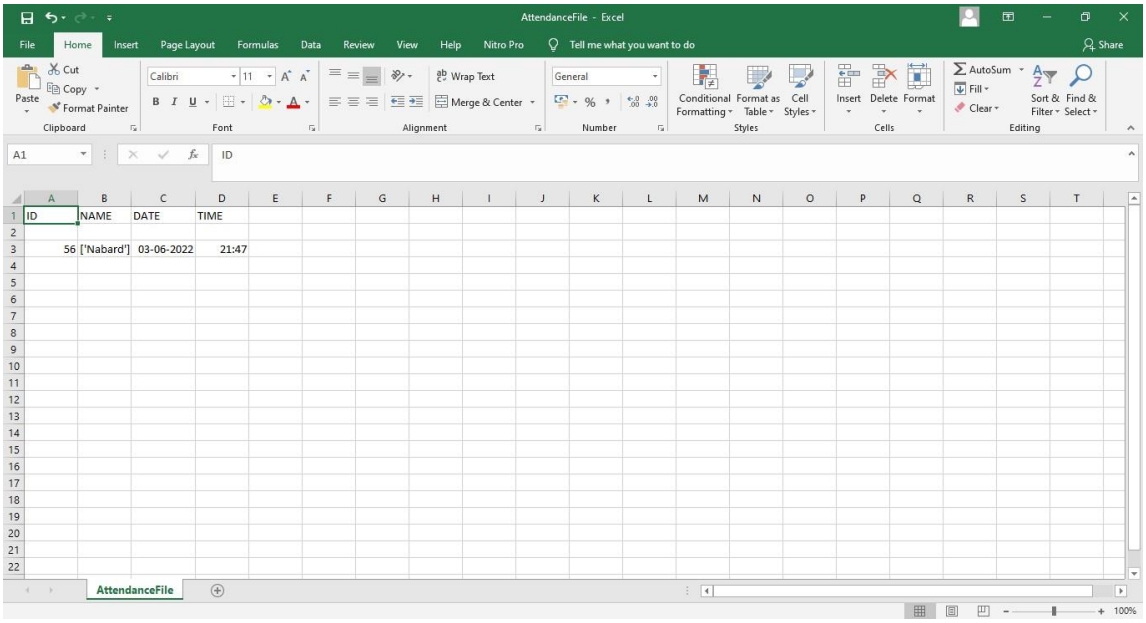
Image Folder



Student Details Datasheet



Attendance Datasheet



CONCLUSION

The project's purpose was to create a facial recognition system for tracking student attendance. Prior to the creation of this project. There are numerous flaws in the old technique of taking attendance, which have produced numerous problems for most schools. As a result, the facial recognition technology built into the attendance tracking system not only ensures accurate attendance but also eliminates the shortcomings in the prior method. Using technology to eliminate faults not only saves time and money, but it also decreases human intervention in the process by delegating all of the difficult tasks to the machine. The sole cost of this technique is having enough space in the database storage to hold all of the faces. Fortunately, such a thing exists that can compensate for the data volume. In this project, the face database was successfully built. Finally, the system not only corrects faults with the prior model, but it also makes it easier for the user to retrieve the acquired data. Assignments, outcomes, and marks are just a few of the things that might be introduced.

ACKNOWLEDGMENT

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