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Facial Recognition Attendance System

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Abstract

By identifying students' frontal faces from classroom photos, this research attempts to construct a general face detection and identification system that will automate the process of gathering school attendance. The main issue with conventional attendance management systems is the accuracy of the data that is gathered. Numerous automated techniques are in use, including biometric attendance. Nonetheless, the effectiveness of these methods is always impacted by scanning equipment technical issues. In order to enhance data quality and information accessibility for authorised parties, this article uses OpenCV for face recognition and principal component analysis techniques for face detection. The database that holds user data in the system was developed using SQL, while the Python programming language was utilised to create the suggested system. After testing, it was determined that the new system is safe and secures students' identities by providing an anonymous attendance environment.

Keywords: (ABS) Face Detection; Attendance; Machine Learning; Database; Principal component analysis;CNN; OpenCV and Face Recognition

1. Introduction

In order to maximise productivity, institutions increasingly need to monitor individuals within the company, such as students and staff. Conversely, monitoring employee or student attendance is essential for any industry to maintain staff or student records. Since attendance is so important to administration, it can quickly turn into a tedious, time-consuming task that is prone to error. Traditionally, instructors manually record students' attendance in class using an attendance form they give, which takes a lot of time [1].

There are negative aspects to many educational procedures, like paper waste and disturbances in the classroom. It has proven to be a challenging task to monitor student attendance during lecture hours. Due to the fact that manual computation produces.

The main problem with the current and existing attendance management systems is the accuracy of the data acquired. This is because it's possible that the original attendee's presence was not noted. The veracity of the data is compromised when a student's attendance is taken by a third party without the institution's knowledge [2]. The second problem with the current system is that it is too slow. Let's say a kid takes one minute to sign a three- to four-page list of names. In one hour, only about sixty students may sign their attendance, which is inefficient and takes time.

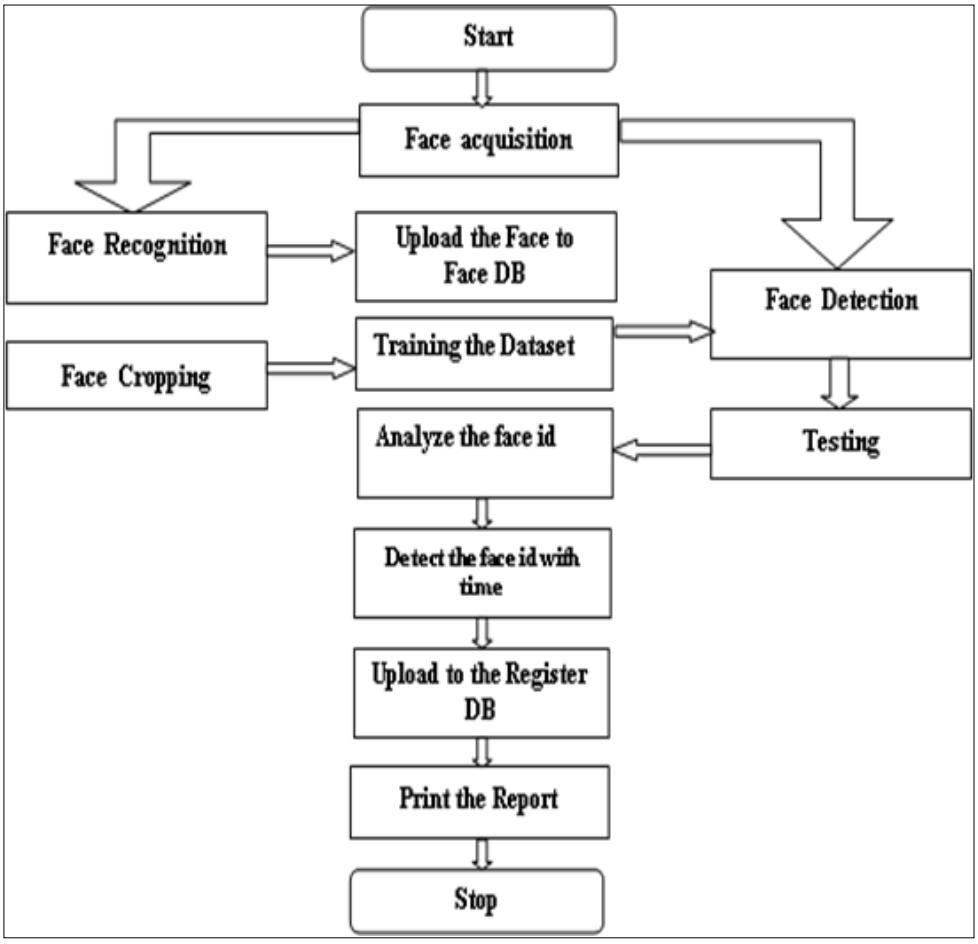

Figure 1 Workflow of the Proposed System

As can be seen from Figure 1, during the picture acquisition stage, the obtained image is converted into numerical data.

At this point, after conversion, the image goes through a number of processes. The collected photos are converted to grayscale images. To improve the quality of the picture, additional processing is applied to it. The detecting module will get the gathered photographs. This is the first step in recognising a face. Faces are recognised by their features or by their composition. In this system, faces are recognised using the LPBH algorithm. By thresholding the area of each pixel in a picture and turning the result into a binary integer, this technique labels every pixel in the image. After face detection, the photographs are cropped and moved on to the next task.

Face recognition is the next challenge after face detection. The cropped image is contrasted with earlier stored pictures in the databases. Feature extraction and categorization are two of the methods used in the face recognition phase. In this stage, the photos taken by the webcam are authenticated by comparing them to previously saved images. This technology calculates the student's attendance based on their facial structure or features if the confirmation is completed.

1.1. Block Diagram of Proposed System

The proposed block diagram of the proposed system is shown in Figure 2.

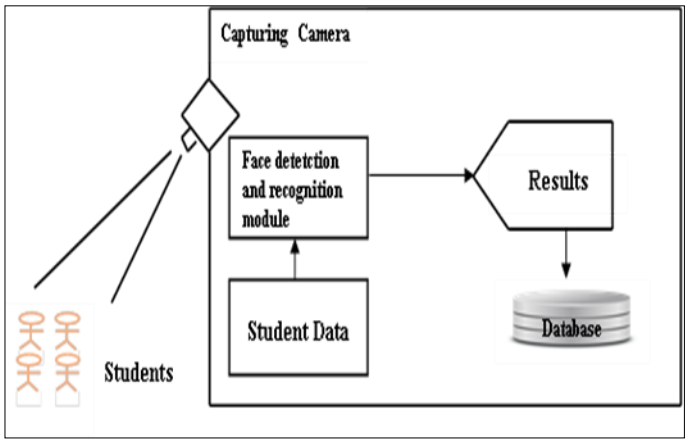

Figure 2 Block Diagram of Proposed System

A webcam camera records the students' faces, as seen in Figure 2. The obtained images are contrasted with the trained data. The result will be entered into the database, and as soon as feasible, the attendance status will be updated.

1.2. General Algorithm and Flowchart of the System

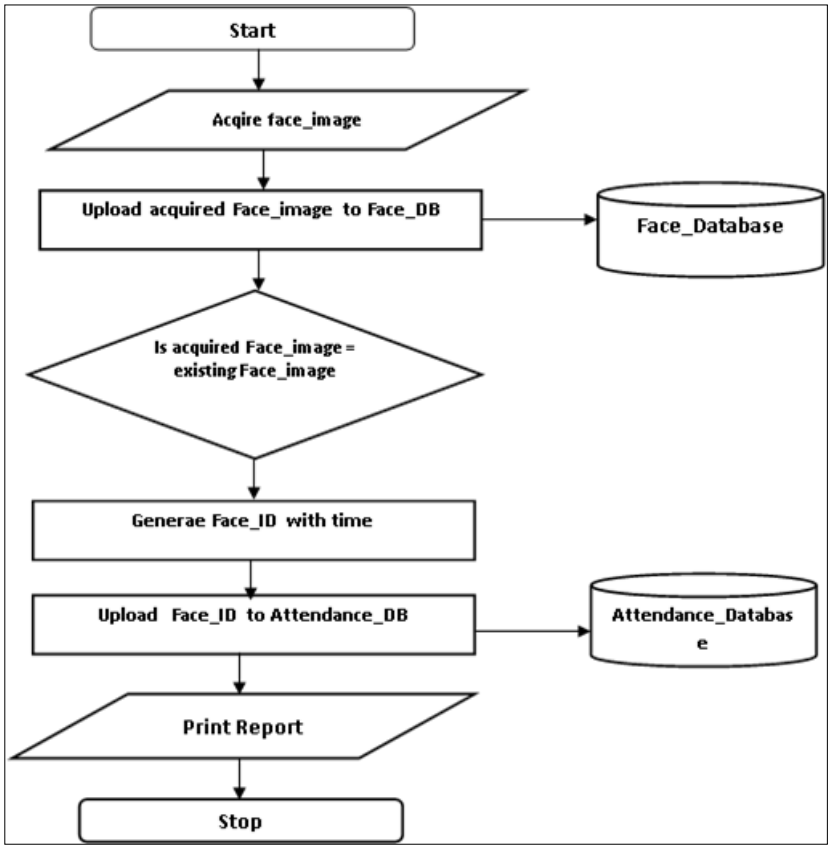

Figure 3 Flowchart of the System

- Start
- Acquire Face_image
- Upload acquired Face_image to Face_DataBase
- If acquired Face_image = existing Face_image Generate Face_ID with time & goto 5Else Print "Record not found" & goto 7
- Upload Face_ID to Attendance_Database
- Print the report
- Stop

1.3. System Use Details

Figure 4 displays the use case diagram. It serves to both explain how to use the system and illustrate the fundamental conditions that must be met for the system to meet the goals this paper has set forth. One by one, the various system actors are displayed. It is also evident that adding to and changing student data falls within the purview of the system administrator.

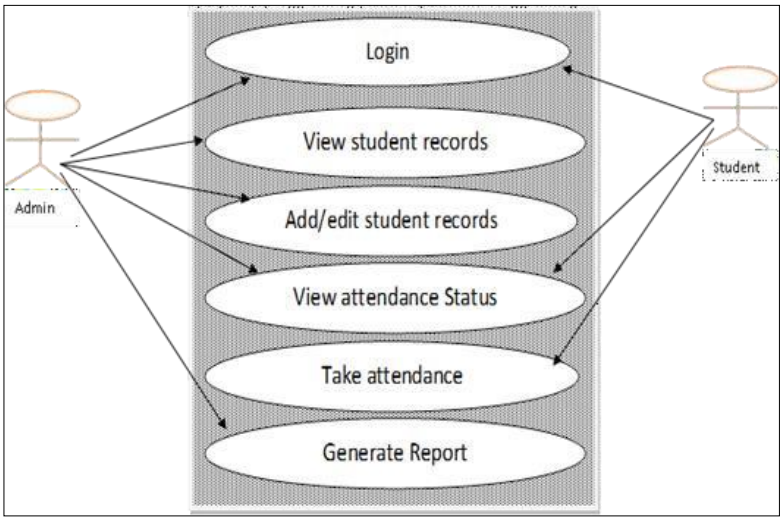

Figure 4 Use case Diagram of the New System

The system administrator is also in charge of creating and viewing reports on students' attendance. On the other hand, modifications to the student records and other information can only be made by the administrator.

2. Results

2.1. Implementation Details of the System

This article uses Python, OpenCV, JavaScript, and CNN to implement the suggested system. Because it is web-based software, it can be accessed using a web browser on a variety of computer devices, including tablets, phablets, and mobile phones. In addition, the system was developed on a Windows computer and tested on a Mac and Linux computer. It was discovered to operate as intended, perform the necessary tasks as needed, and pose no compatibility issues. A database that was intended to store facial features taken from webcam photos and enable speedy retrieval via the interface was likewise made using SQL. Because it holds all of the paperwork required to maintain and organise all of the information, the storage facility is essential.

2.2. Homepage

The homepage navigation menu consisted of the following five items: Home, About, Contact, Admin login (sign up), and a brief description of the project and library used. Figure 5 illustrates that a user needs to be logged in or registered in order to access the login screen.

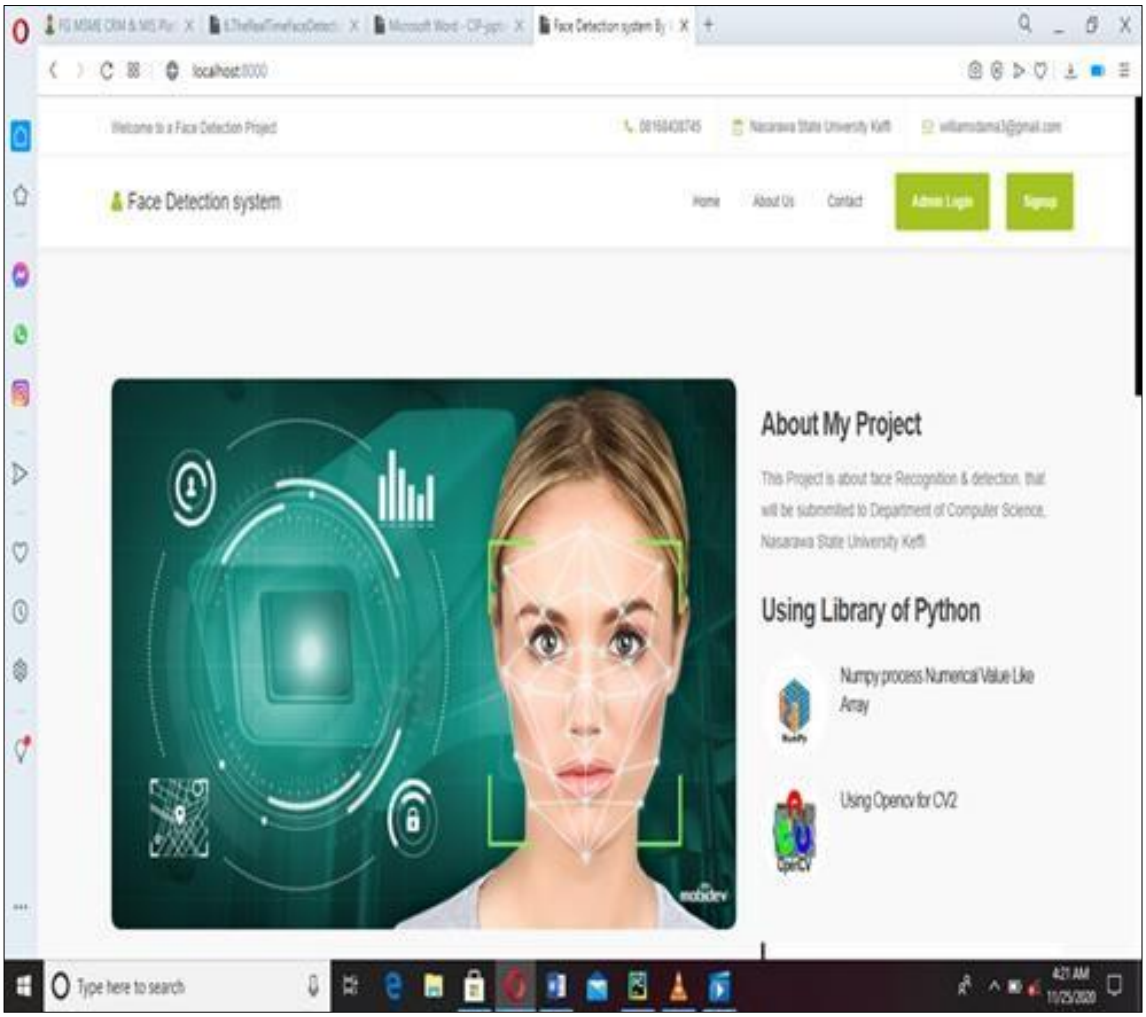

Figure 5 Homepage

2.3. Users Registration Page

The new user has to register before they may access the system. Additionally, the user needs to register for an account on the Sign Up (Register) page (saved within the system) by providing their email address, phone number, address, username, password, first and last names, and a picture of themselves. After that, the user hits the submit button to start taking many snapshots using the PC webcam. The captured image is then used to train the system to identify and detect the user's face. Figure 6 shows the users' registration page.

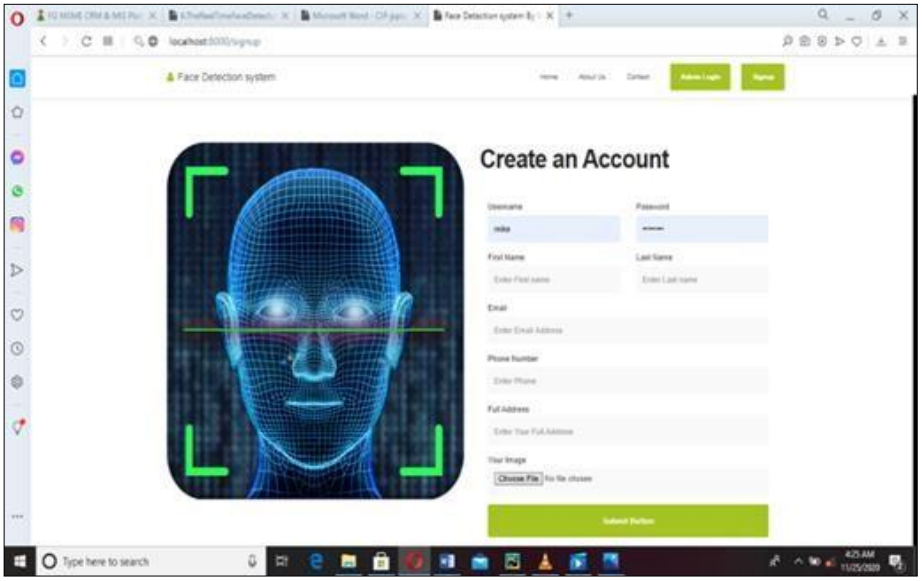

Figure 6 User's Registration Page (signup)

2.4. Admin & Users Log in Page

The login page for the administrator is identical to that of the user, but it contains different permissions, suggesting that the administrator has more authority. As illustrated in Figure 7, the user must enter their username and password in order to log in. However, depending on the user's duty, the system is burdened with the task of displaying system interfaces.

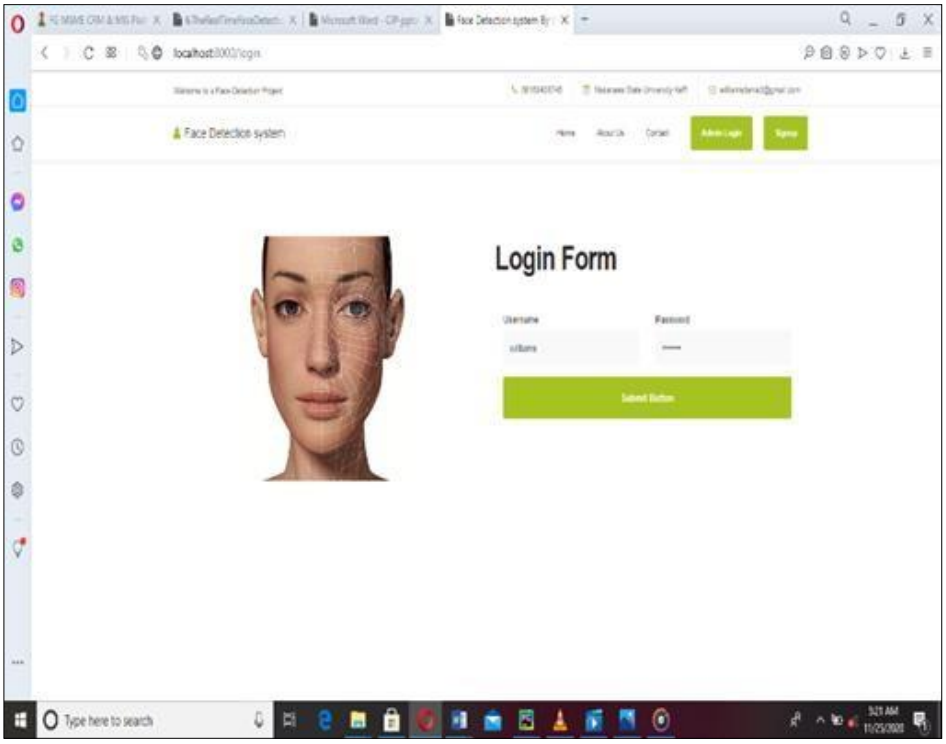

Figure 7 Admin and User Login Page

2.5. Admin Dashboard

The administrator can manage users, control system login, and change other system configurations from this home. The administrator page was created so that the administrator could supervise the actions performed on the framework. Only the admin has access to this page. The side menu on this page has more options than a user's, as Figure 8 illustrates.

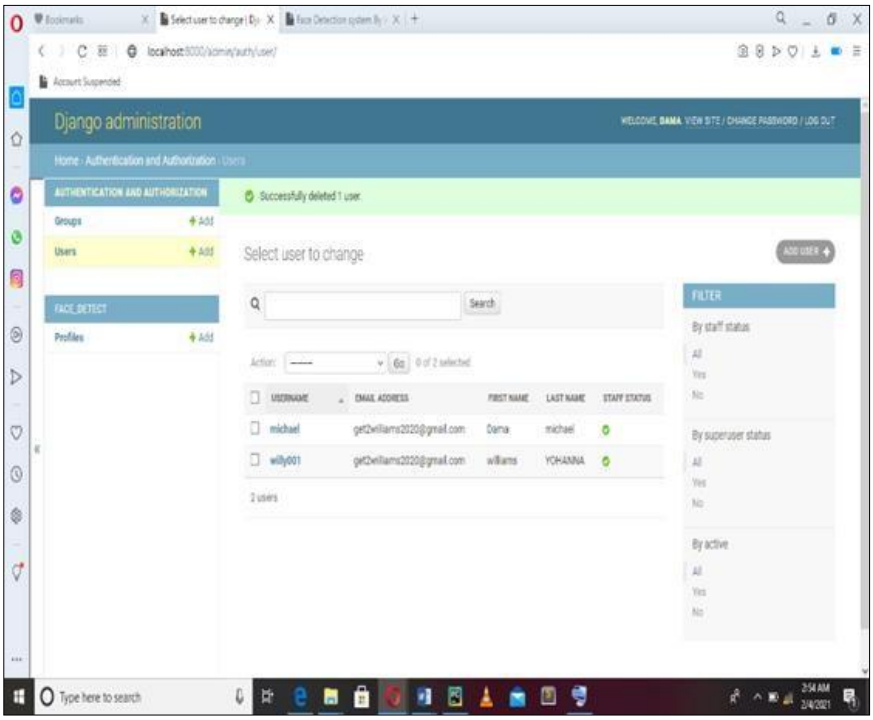

Figure 8 Admin Dashboard

2.6. Admin View Users Page

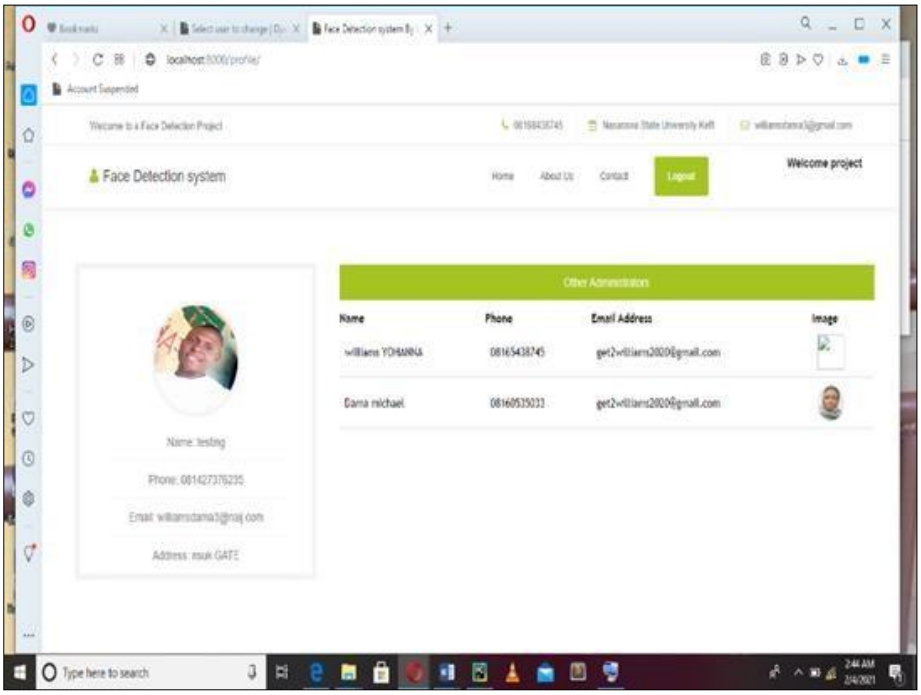

Figure 9 Admin Dashboard

This page gives the admin the ability to see a user's behaviour within the system as well as access to their personal information. As seen in Figure 9, this page shows the logs of the user's system access.

3. Discussion

Because both PCA and OpenCV have a high recognition rate, their integration in this work was efficient and successful. Technically speaking, the recognition accuracy rate of Hepani et al. (2018)'s work is modest, ranging from 45 to 50 percent. Similar to this, Schiller et al. (2020) found that when using saliency maps to estimate the likelihood of fixating a particular area in an observed picture, the temporal dimension of visual attention deployment poses a significant challenge. In line with this, Nandhini et al. (2019) found that it can be difficult to determine how quickly and how long it takes to convert obtained images into frames. But this new approach is quicker and more effective in identifying and identifying images, as well as at capturing and adding student records to the database. To make sure the suggested revised system works as planned and doesn't cause any compatibility problems, a last test was conducted.

4. Conclusion

Students' attendance records are required by almost all academic institutions, and maintaining physical attendance records can be a difficult and time-consuming task. Therefore, utilising facial recognition to automatically take attendance will be very helpful and less error-prone than the manual method. This will also reduce time consumption and tampering with student attendance records. Facial recognition-based automated attendance systems are simple, precise, and efficient. This mechanism runs automatically as soon as the administration creates each student's registration. In order to increase recognition accuracy and system performance, a few appearance-sensing algorithms must be implemented. These measures are taken when the person is facing the camera, stored in a database, and used for comparison. One of the primary benefits of facial recognition technology is its non-intrusive nature. Verification of identification can occur up to two feet away, and it doesn't require the user to wait for a long time or do anything other than look at the camera. Attendance is often kept on file on a paper attendance sheet. The methods used today to track attendance are laborious and time-consuming. Manually recorded attendance is easily manipulated. Furthermore, it can be challenging to check each student individually in a huge company with numerous locations. Therefore, the goal of this study was to address each of these issues.

Recommendation

One of the best uses of image processing in the fields of technology and security is face recognition. Verification using human face recognition is essential, particularly for student attendance. An automated method was employed in this study to monitor attendance. The methods used today to track attendance are laborious and time-consuming. Manually recorded attendance is easily manipulated. To get past all of these obstacles, an electronic attendance system was put in place using facial recognition technology. Face recognition, or just face recognition, examines the characteristics of a person's image of their face that is captured by a camera. In addition to evaluating the facial contours, it measures the separation between the corners of the mouth, jaw, nose, and eyes.

Future work

The future scope of the projected task can be ascertained by taking several high-quality personnel photos and storing them on any cloud innovation. ATMs can be created with this infrastructure in place. Additionally, the framework can be applied during election seasons, when voters can be identified using facial recognition.

Compliance with ethical standards

Acknowledgments

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Disclosure of conflict of interest

The authors declare that there is no conflict of interest.

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