

Smart Attendance System using Facial Recognition

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Abstract: *The most important part of classroom management is taking attendance of the students. Hence, maintaining the attendance record with day-to-day activities is a challenging task. The traditional method of calling name of each student is time-consuming and there is always a chance of proxy, prone to errors, such as incorrect entries or manual calculation mistakes. The daily attendance of students is a recorded subject wise which is stored by the administrator. Our system helps to take attendance by detecting the persons face and matching it with the ones stored in the database. Our proposed system can be implemented in any field where an attendance system is present and thus, plays a vital role. In this project, the Open CV python library along with LBPH and Haar Cascade algorithm has been used for face recognition approach. This model integrates an external camera that captures an input image, and an algorithm for detecting faces from an input image, marking the attendance in a spreadsheet which gets updated in the web application. The training database is created by training the system with the faces of the authorized students. The cropped images are then stored as a database with respective labels. The features are extracted using the LBPH algorithm. Our proposed system will help in saving time and will efficiently identify and eliminate the chances of proxy attendance. In addition, it's greatest to say this project is an engineering solution for all universities and colleges to track and manage attendance.*

Keywords: Open CV, LBPH, Haar Cascade

I. INTRODUCTION

In this era of technology and automation we are still using the same old classroom management system. The most important thing in the classroom is the attendance record of the students. Regular attendance in the class is, undoubtedly, the most prior condition for the students to ensure a good academic performance. We have been using techniques like calling out names or roll numbers of the students and signing on the sheet against a particular roll number. These methods carry a high chance of proxy and are time consuming. These methods carry a high chance of proxy and are time consuming. On the other hand, minimum 75 percent attendance is mandatory to avoid being barred from the examination. Hence, we came across the idea of automating this process with the help of modern technologies to get a well-maintained and disciplined classroom. Therefore, Smart attendance systems using facial recognition technology are an innovative solution that automates the process of taking attendance, thereby eliminating the need for manual attendance-taking.

II. LITERATURE REVIEW

The primary aim of this paper is to implement a smart attendance system using facial recognition to automate the process of taking attendance in various settings, such as schools, universities, workplaces, and other organizations. Facial recognition technology can quickly and accurately identify individuals by analyzing their facial features and matching them against a database of known individuals. By integrating this technology into an attendance system, organizations can eliminate the need for manual attendance-taking processes, such as calling out names or using sign-in sheets.

PAPER NAME : STUDENT ATTENDANCE SYSTEM USING FACE RECOGNITION

[1] S. Dev and T. Patnaik, S. Dev and T. Patnaik proposed a system that uses a database of student's faces and their essential details. Multiple cameras capture images during lectures, and the system detects faces using multiple instances. The KNN algorithm proved to be the best with an accuracy of 99.27%. The system was tested under various

conditions and proved to work efficiently. The proposed system was tested on 200 real-time images of a classroom with a maximum strength of 70 students.

PAPER NAME : FACE RECOGNITION SMART ATTENDANCE SYSTEM

[2] A. Arjun Raj, M. Shoheb, K. Arvind and K. S. Chethan, have developed a system that automatically marks the attendance for students by recognizing their faces. The system requires a Raspberry Pi 3, a servo motor to control the camera's direction, a camera, and the OpenCV and Dlib libraries using Python. The camera is placed in a suitable location in the classroom to capture all students. The captured images are transformed into grayscale and equalized using histogram methods. The system employs the LBPH face recognizer algorithm to identify the student's face in real-time, overcoming problems of different head orientations and occlusion. The algorithm compares the test image with the training image to determine whether the student is present or absent. The attendance records are automatically stored in an Excel sheet. If a student is absent, a message is sent to their parent's phone number using GSM. Students can check their attendance using an Android application developed using MIT inventor.

PAPER NAME : AUTOMATED SMART ATTENDANCE SYSTEM USING FACE RECOGNITION

[3] Kolipaka Preethi, swathy Vodithala have proposed a system that can automatically recognize students' faces and mark their attendance in real time without human intervention. This system can identify and recognize faces in a controlled environment. The proposed method uses the eigenface approach, Fisher faces, and Local Binary Pattern Histogram (LBPH) for facial recognition and detection within a specific area of the surveillance camera. The technique has been experimentally tested, and it has shown reliable outcomes for pose variance and illumination. Moreover, it processes the entire image in a relatively shorter amount of time.

PAPER NAME : SMART ATTENDANCE MARKING SYSTEM USING FACE RECOGNITION

[4] R. Azhaguraj, P. A. Kumar, S. Kadalaraman, K. Karthick and G. Shunmugalakshmi, proposed a system that uses face recognition technology to automatically mark attendance in classrooms or other similar settings. The system consists of a camera that captures images of the faces of students as they enter the classroom and a face recognition algorithm that compares the captured images with a database of registered faces to identify and mark attendance. The system uses OpenCV and Python programming languages to perform face detection and recognition tasks. The authors also used the Haar-like features and Local Binary Pattern (LBP) algorithms for feature extraction and the Linear Discriminant Analysis (LDA) for feature reduction. The system was tested on a dataset of 50 students and achieved an overall accuracy of 96.5%. The authors reported that the system was able to successfully recognize and mark the attendance of all students who entered the classroom during the test period.

PAPER NAME : RFID AND FACE RECOGNITION BASED SMART ATTENDANCE SYSTEM

[5] Keerthana Sanath, Meenakshi K, MukthaRajan, Varshini Balamurugan, M. E. Harikumar proposed a simple attendance system that initially performs RFID validation that is followed by a contactless temperature check. The details of the employee corresponding to the RFID card along with the status of the temperature (high or normal) are pushed to the database. In case of high temperature, an alert message containing the details of the employee corresponding to the RFID card is sent to the concerned authorities. On the other hand, if the temperature is normal, the access time verification for the corresponding employee will be done. In case if the access time doesn't match, a message "Please come after some time" will be displayed else a message "Authorized access" is displayed. The next step of verification is facial recognition in which a random image of the employee is given as input from the dataset created. If the predicted face matches the face associated with the corresponding RFID card, a message "Thank you for cooperating for the second tier of security" is displayed and his/her access is granted, else "The wrong face detected" is displayed. This system uses hardware components namely NodeMCU, temperature sensor, RFID card reader, RFID tags for individual employees, and software platforms namely Arduino for processing inputs received in the NodeMCU, Google Colab for checking access time, training the models for facial and emotion recognition, MIT app inventor for creating an application to send message to the authorities in case of high temperature. The database used in this project is Firebase for cloud storage.

PAPER NAME : SMART ATTENDANCE SYSTEM BASED ON FACE RECOGNITION TECHNIQUES

[6] A. Al-sabaei, H. Al-khateeb, A. Al-basser, H. Al-Sameai, M. Alshameri and M. Derhem, proposed attendance system that works easily and smoothly and can be used by anyone in any government or private facility. This automated system consists of a camera installed next to the device, a file containing photos of the persons allowed to record the

time of presence and leaving with the status details when clocking in or out and the total time of work, and a database that records attendance and save it in an excel file in CSV format. The person stands in front of the camera, if their face is recognized, he is allowed to press the presence or leaving buttons, then attendance information is stored and synchronized with the time and date on which it was registered. In this paper, they proposed a high-performance face recognition pipeline using novel convolutional neural network architecture for real-time facial recognition with high accuracy, fast time, and lower cost.

PAPER NAME : REAL TIME SMART ATTENDANCE SYSTEM USING FACE RECOGNITION TECHNIQUES

[7] S. Sawhney, K. Kacker, S. Jain, S. N. Singh and R. Garg develop a smart attendance management system, The main approach which needs to be followed is to tally a fairly recent image of a student to that of some images which were taken deliberately and stored in the database, which further be used to mark the attendance if the images in the database match to the real-time image. The automated attendance management system has a very simple and easy-to-implement architecture. The system consists of two databases, a student database, and an attendance database. The student database is for storing the details of the student in a particular class. On the other hand, the attendance database, as the name suggests, is for marking and maintaining the attendance records of students attending a particular lecture. For the accomplishment of marking attendance, this system will have a high-definition camera installed outside the classroom. Students will avail the access to enter the classroom, by scanning their faces in that camera. Another camera will be installed inside the classroom in such a way that every student in the class will be visible to the lens of the camera. Facial detection and recognition algorithms will be applied to both the cameras to analyze the faces and mark their attendance accordingly.

PAPER NAME : ATTENDANCE MANAGEMENT SYSTEM USING FACIAL RECOGNITION

[8] I. Rajput et al., proposed system is an attendance management system that utilizes facial recognition technology to automate the attendance process in educational institutions and workplaces. The system consists of three main components: face detection, face recognition, and attendance marking. The system uses a camera to capture the facial features of individuals, which are then processed by the face detection component to identify and locate the face in the image. The system then uses the face recognition component, which employs Convolutional Neural Network (CNN) algorithms, to compare the captured facial features with the stored images in the database. If a match is found, the attendance marking component updates the attendance record of the individual. The proposed system is evaluated using a dataset of 200 face images, and the results show that the system achieves high accuracy in recognizing faces and marking attendance. The system can detect and recognize multiple faces in real-time, making it suitable for use in large groups.

PAPER NAME : GROUP FACE RECOGNITION SMART ATTENDANCE SYSTEM USING CONVOLUTION NEURAL NETWORK

[9] V. M., D. R. and P. B. S proposed system, described in the paper is a Group Face Recognition Smart Attendance System that uses Convolutional Neural Networks (CNNs) to automate the process of attendance tracking in a classroom or other organizational setting. The system is designed to recognize multiple faces in a group photo and accurately mark the attendance of each individual. It works by capturing a group photo of individuals as they enter a room and then using CNNs to identify each individual and mark them as present for the class or meeting. The system can handle a large number of individuals in a group photo and is also able to handle variations in lighting, facial expressions, and poses. Additionally, the system includes features for generating attendance reports and analytics, allowing teachers and administrators to track attendance patterns and identify potential issues. The accuracy of the proposed system is reported to be over 90%, which is relatively high for face recognition system. The accuracy is achieved through the use of CNNs, which are a type of deep learning algorithm that is particularly effective for image recognition tasks.

PAPER NAME : FACE RECOGNITION BASED CLASS MANAGEMENT AND ATTENDANCE SYSTEM

[10] S. S. Pawaskar and A. M. Chavan developed the system that follows four steps. Firstly, the record of each student is added (i.e Roll Number and Name) and a video is captured, the images are taken from the frames of the video. In the training process - the second step, the images of the student are trained using LBPH and Haar Cascade and saved in the form of a YML file. In the tracking process - the third step, the database of trained images is compared with the student's face to track the student's face. Lastly, the attendance is marked in the CSV file for the tracked student with respective time and date.

III. PROPOSED SYSTEM

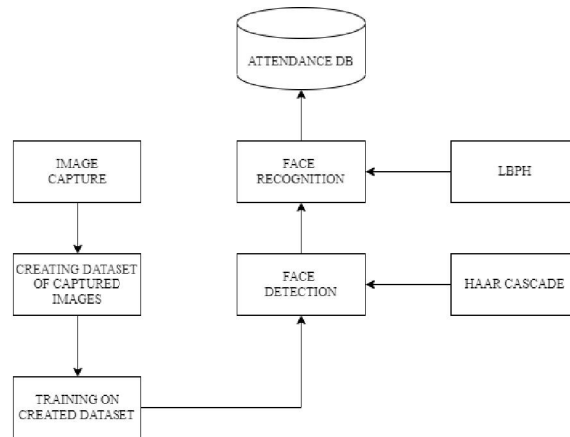


Figure 2:Architecture of Proposed System

Initially, the image of the User/Student is captured through an Internal or External camera then the image is stored in a particular folder creating a dataset of these images afterward the training is done using this created dataset next System detects the face of the User/Student using the Haar cascade algorithm, subsequently Face recognition is done using LBPH algorithm, accordingly the user/students attendance is marked in the database.

IV. METHODOLOGY

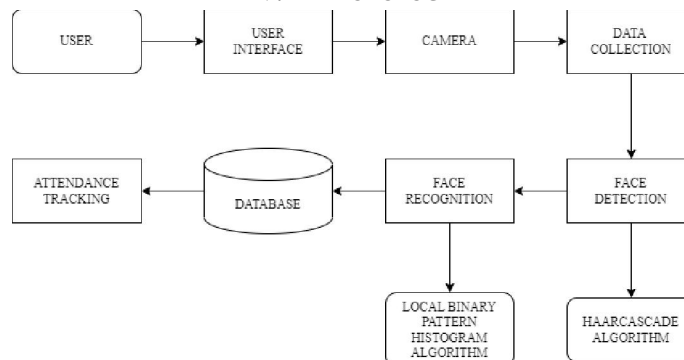


Figure 2:Workflow of System

Data Collection: The first step is to collect images of student’s faces. This can be done either by taking pictures of individuals or by using existing image datasets.

Face Detection: The next step is to detect the faces in the collected images. This is done using the Haar cascade algorithm.

Face Recognition: After detecting faces, the system identifies whose face it is. This is done using a facial recognition algorithm called Local Binary Patterns Histograms (LBPH).

Database Management: The system maintains a database of student’ images and their corresponding identities. This is done using MySQL Database.

Attendance Tracking: Once a student’s identity is confirmed, the system marks them as present for that particular day. This information is stored in the database and used for attendance-tracking purposes.

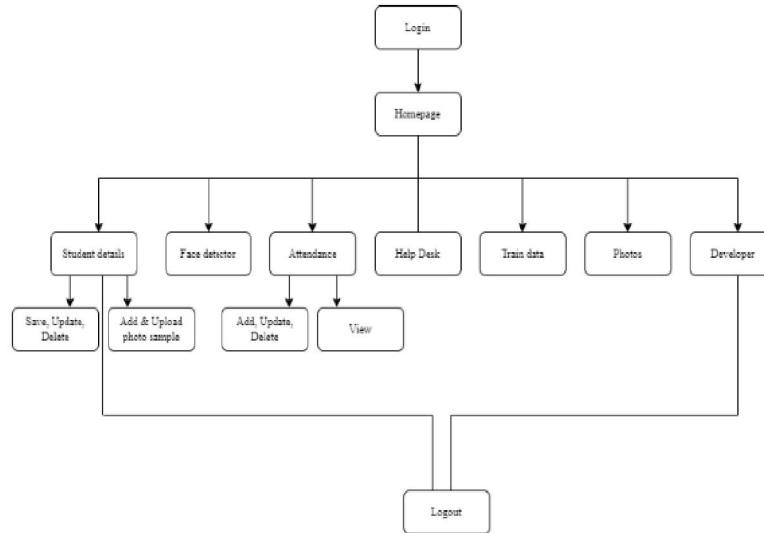


Figure 3:Admin activity diagram

Following is the explanation of the Activity Diagram:

The admin logs in to the system, and the system then displays the homepage and selects the “Student details” option. The system displays the student information page wherein, the admin can Save, Update, Delete, Add, and Upload sample images. The admin selects the “Face detector” option to detect the faces of the registered students. Then select the “Attendance” option. Wherein, the admin can manually Add, Update, Delete, and View the records of the students. When the admin selects the “Help Desk” option. Wherein, the system displays all the social network links. The admin selects the “Train Data” option. Wherein, the system displays the page where data gets trained. The admin selects the “Photos” option. The system then displays the photos of all the registered students. The admin selects the “Developer” option. The system then displays all the developer's information

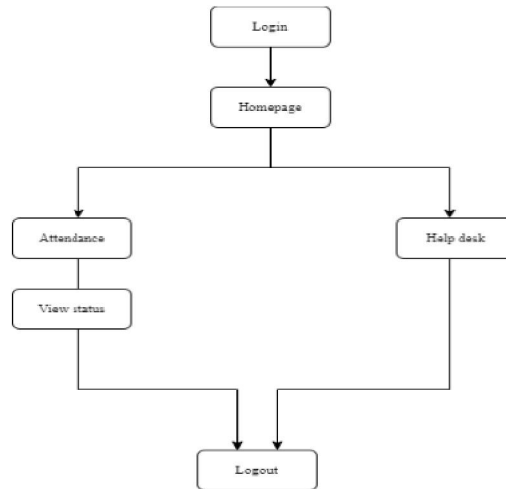


Figure 4:Student activity diagram

Following the explanation of the Student Activity Diagram:

External camera: The image of the student as an input image gets captured by our external camera which is integrated into our system.

Face detection process: The objective here is using ML algorithms to find human faces within the image captured, and probably extract them to be used by the face recognition algorithm.

Face recognition process: In this, with the already extracted facial image, cropped, resized, and usually converted to grayscale, the face recognition algorithm is responsible for comparing the captured image with the images stored in the database.

The database: It stores the faces of the authorized students, which gets used for the whole comparison of the captured image.

Report generation: A CSV file gets generated based on the present and absent students along with their proper date and time.

Application: The attendance status of each student is displayed in the system.

IV. RESULT

Here are the screenshots and brief descriptions of the design of our proposed system by which our system can be more Understandable.

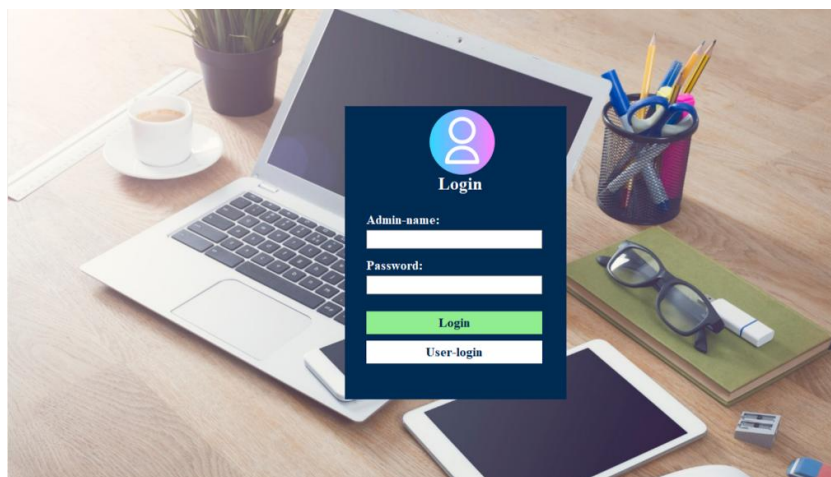


Figure 5.1 :Admin Login Page

The image in Figure 5.1 shows the Admin login page where an admin has to use his/her login credentials such as username and password to login in their own account.



Figure 5.2:Home Page of Admin module

The image in Figure 5.2 represents the homepage of our system. Whenever an Admin logs into the system, the home page gets displayed. It consists of different modules like student details, face recognition, training dataset, and attendance in the csv format, photos and developer panel. Clicking on any one of the module will direct the admin to the respective page.

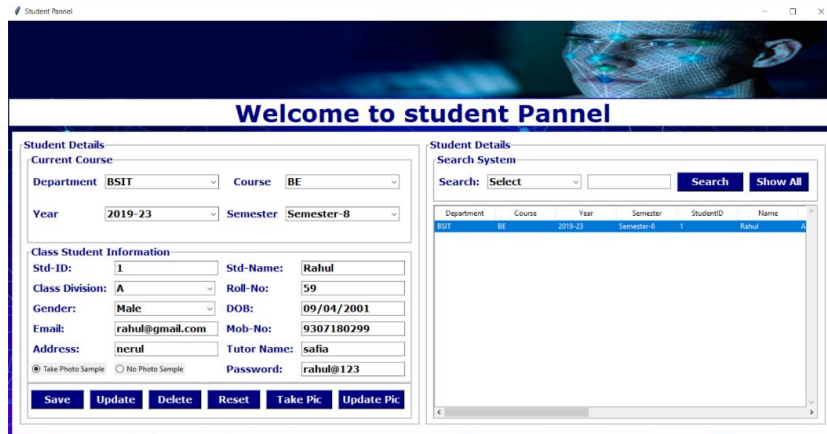


Figure 5.3: Registration Page

The image in the Figure 5.3 represents the Student registration page where the particular student's personal information is registered.

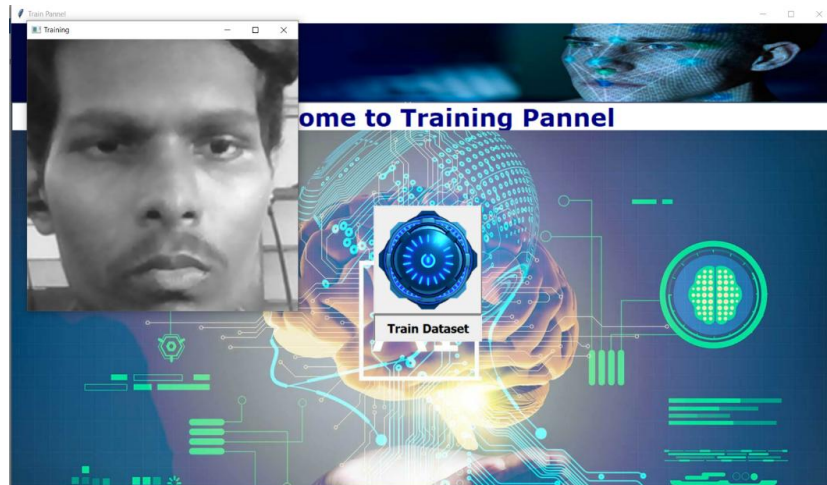


Figure 5.4: Train Data page

The image in the Figure 5.4 is the Training Panel, where in it trains the dataset which are present in the data folder already, it takes all the images from it and trains it at once.



Figure 5.5: Dataset Images

The image in the Figure 5.5 is the Photos, where in the dataset images are present inside the data folder for training data purpose.

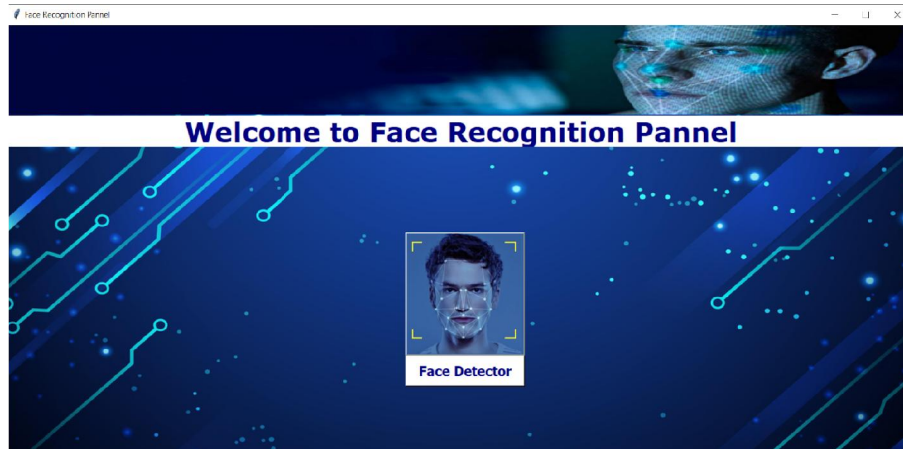


Figure 5.6: Face Detector page

The image in the Figure 5.6 shows the Face Recognition Module where in the student's face gets detected and recognized.



Figure 5.7: Face Detector page

The image in the Figure 5.7 shows registered student's face being recognized and displays its relevant information.

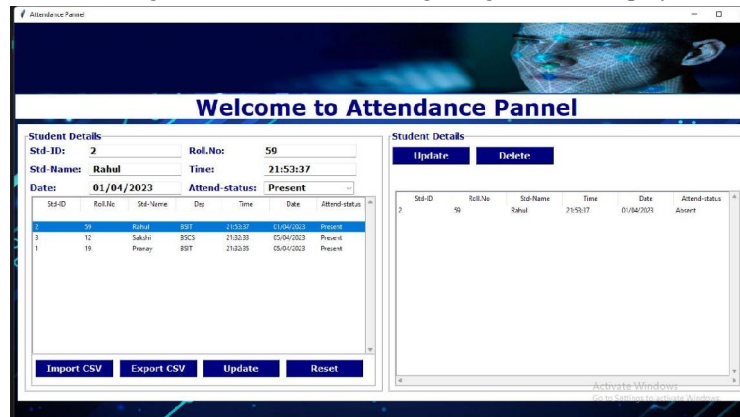


Figure 5.8: Face Detector page

Once the face is Detected and Recognized, attendance for the particular student is marked in our system which can be viewed through Attendance module.

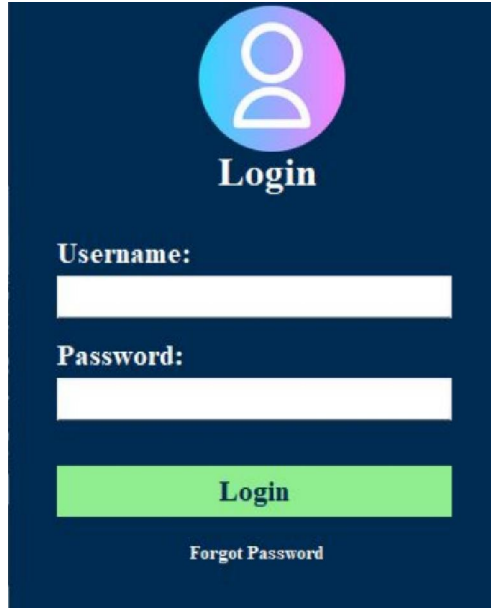


Figure 5.9: Student login page

The image in Figure 5.9 shows the Student login page where any student has to use his/her login credentials such as username and password to login in their own account.

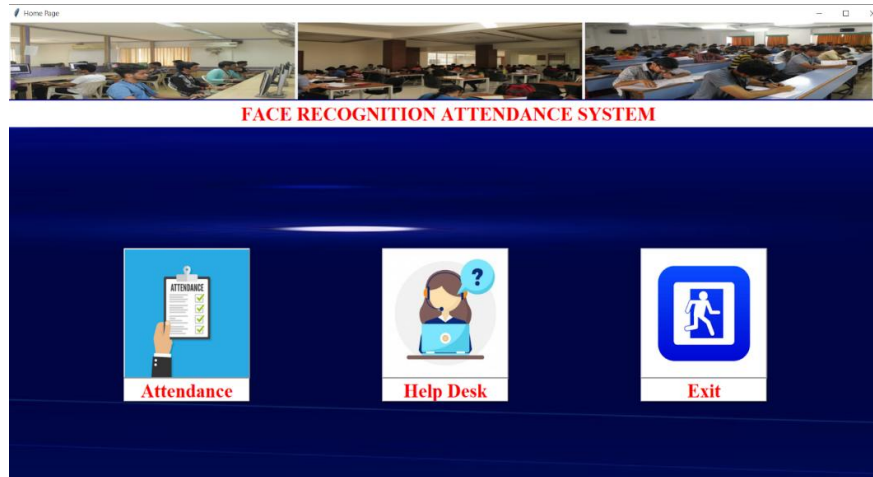


Figure 5.10:Homepage of the student module

The image in Figure 5.10 represents the homepage of Student module. Whenever any student logs into the system, this home page gets displayed. It consists of modules like Attendance where student can view their attendance status, help desk for any query purpose.

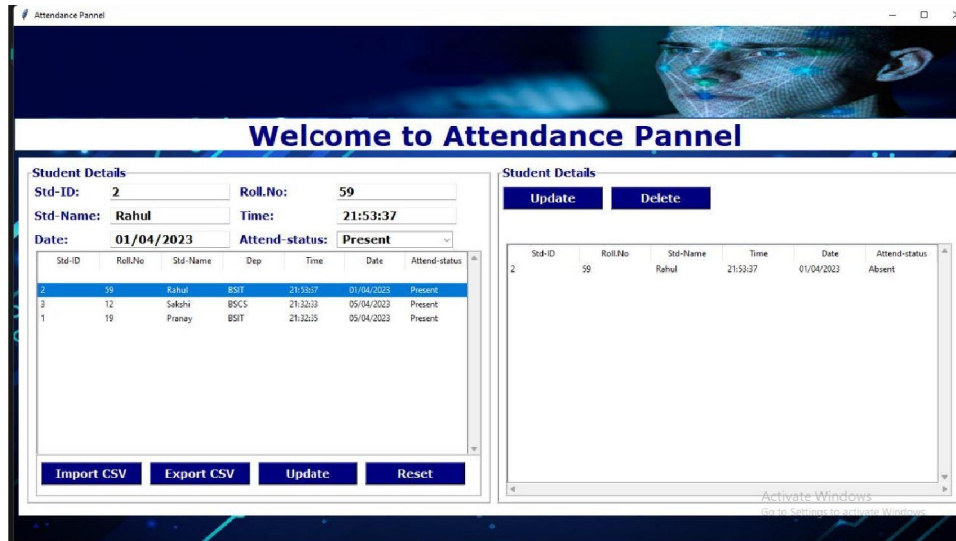


Figure 5.11:Attendance module

Once the face is Detected and Recognized, attendance for the particular student is marked in our system which can be viewed through Attendance module.

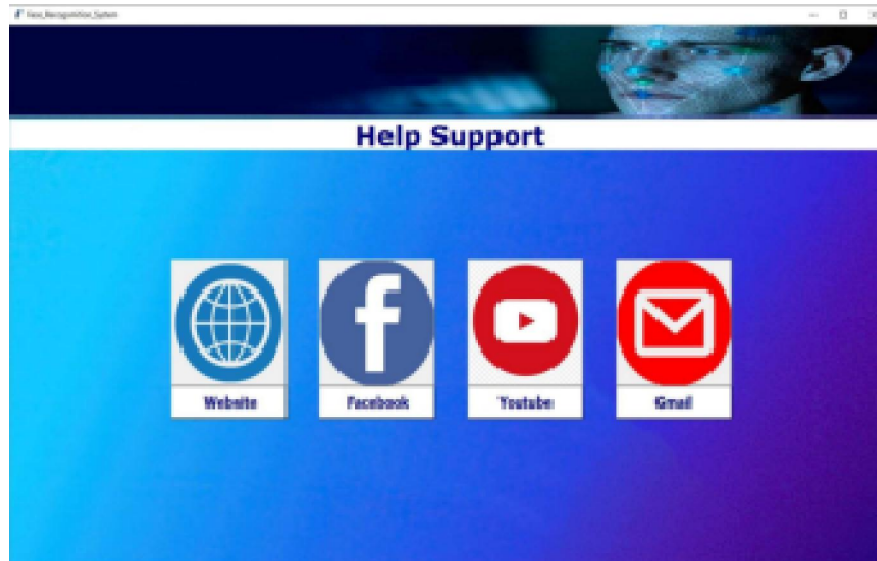


Figure 5.12:Help Desk

The Image shown in Figure 5.12 is the Help desk module, which allows the users to connect with us through our social media platforms regarding any query or support.

V. CONCLUSION

A smart attendance system using facial recognition technology offers an efficient and secure way of managing attendance records in various organizations. This technology has the potential to save time and resources by automating the attendance process and eliminating the need for manual data entry. Additionally, it provides a reliable way of identifying individuals, as facial recognition is considered one of the most accurate biometric identification methods. Overall, the smart attendance system using facial recognition technology is a promising solution that can bring about significant improvements in attendance management for various sectors.

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