VISVESVARAYA TECHNOLOGICAL UNIVERSITY

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A Project Report on

"Online Attendance System using Machine Learning Algorithms"

Project report Submitted in partial fulfilment of the requirements for the

Award of degree of

BACHELOR OF ENGINEERING IN INFORMATION SCIENCE AND ENGINEERING

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CERTIFICATE

Certified that the project work entitled **"Online Attendance System using Machine Learning Algorithms "** carried out by **Ms. Amulya R,** USN: **1JT17IS004, Ms. Jahnavi S,** USN: **1JT17IS015, Ms. Trupthi BV** USN: **1JT17IS048, Ms. Divya P** USN: **1JT17IS008,**who are bonafide students of Jyothy Institute of Technology, submitted in partial fulfillment for the award of **Bachelor of Engineering** in Information Science and Engineering department of the **Visvesvaraya Technological University**, Belagavi during the year 2020-2021. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the said Degree.

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DECLARATION

We, **Amulya R, Jahnavi S, Trupthi BV, Divya P** students of Eighth semester BE, in the Department of Information Science and Engineering, Jyothy Institute Of Technology, Bengaluru, declare that the project work entitled **"Online Attendance System using Machine Learning Algorithms"** which is being submitted by us in the partial fulfillment for the award of the degree of **Bachelor of Engineering in Information Science and Engineering, from Visvesvaraya Technological University, Belagavi** carried out during the academic year 2020-2021, under the guidance of **Kalpitha N**, Assistant Professor, Department of Information Science & Engineering, Jyothy Institute Of Technology, Bengaluru. The matter embodied in the project report has not been submitted previously for the award of any degree or diploma by us to any other university or institution.

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ABSTRACT

In 21st century, everything around us is dependent upon technology to make our life much easier. Daily tasks are continuously becoming computerized.

Nowadays more people prefer to do their work electronically. To the best of our knowledge, the process of recording students' attendance at the university is still manual. Professors go through manual attendance sheets and signed papers to record attendance. This technique is prone to certain problems like human errors, time theft, maintenance work, etc.

So, to overcome all these difficulties we have proposed the face recognition-based attendance monitoring system. The main purpose of this project is to create a face recognition attendance system for institution to reinforce and upgrade the present attending system. We also provide Face Authentication to the lectures to prevent opening of system from trespassers.

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CHAPTER-1

INTRODUCTION

1.1 Overview

Day to day activities in an institution all over the world some or the other way involves in taking attendance of the students who are present in the classrooms. Traditionally the attendance is taken through a roll call, this takes a lot of time and may sometime lead to a false attendance. To overcome this tedious process this project aims to reduce the time and mistakes made by the traditional process by introducing facial recognition as a solution, this helps in many ways from keeping a large register in short space to avoiding false attendance. This project showcases the ability of facial recognition using LBPH algorithm and Haar cascading algorithms combined.

There are situations where student act as proxies for their friends even though they are not present. This system, which is based on face detection and recognition algorithms, spontaneously detects the student when he enters the class room and marks the attendance by recognizing him. The database is then modified or updated automatically. This reduces time and effort of manually updating the attendance. This system also provides authentication using recognition of face of the admin or teacher to unlock as there are chances of trespassing by the third party. So this rises the security of the system.

1.2 Face Recognition Attendance System

Technology has developed by Artificial Intelligence lab, which can recognize faces with up to 97.3% accuracy, which are 2.7 less accurate than humans. Facial recognition is something we've evolved to do. Hence AI identification endeavours to mimic this manner of human. The system will cleave the face into visible marks called nodal points which presents the things like the distance between eyes, depth of the eyes sockets and width of the nose. So the difference between these areas is used to create a unique code of face print.

Manual attendance marking in a class is a bit burdensome due to a wide number of students present in a class and maybe a chance of proxy attendance. So building a face recognition based attendance system which can manage the records of the students will be more efficient, advantageous also time saving and secured.

1.3 Main Characteristics

Face recognition- based attendance system is a process of recognizing the students face for taking attendance by using face biometrics based on high- definition monitor video and other information technology. Facial recognition technology is a system or software which is capable enough to verify the identity of a person from analysing an image or video footage. The main characteristics are:

- Real-time face detection and processing
- Detection of a live person
- Effective access control
- Students can view and update their details.
- Ease of use
- Faculties can add, delete, update and view student details
- Faculties can view attendance of present day with the count of absentees, presents and the total strength.

1.4 Advantages of Face Recognition based Attendance System

The main advantages of face recognition based attendance system are:

- This system is very cost effective, as every process is done by a computer which includes taking attendance, analysing it and processing it.
- This system saves lot of time and is also faster method to record attendance.
- Managing this system is very easy as it is fully automated, and it keeps track of day to day activities.

1.5 Disadvantage of Face Recognition based Attendance System

Disadvantages are:

- If the system goes to the wrong hands, then it will be disaster.
- This system has a very strict security to safeguard the information of the students.
- Sometimes there have been instances where the identity of a person is not able to get verified. There have been also cases where identity of a person is verified with another person's identity. Hence it is low reliable.
- Accuracy can vary due to lack of conditions, like lighting, postures of the student, etc.

1.6 Problem Definition

Traditional student attendance marking technique is often facing a lot of trouble. The face recognition student attendance system emphasizes its simplicity by eliminating classical

student attendance marking technique such as calling student names or checking respective identification cards. There are not only disturbing the teaching process but also causes distraction for students during exam sessions. Apart from calling names, attendance sheet is passed around the classroom during the lecture sessions. The lecture class especially the class with a large number of students might find it difficult to have the attendance sheet being passed around the class. Thus, face recognition student attendance system is proposed in order to replace the manual signing of the presence of students which are burdensome and causes students get distracted in order to sign for their attendance.

1.7 Problem Statement

The main intention of this project is to solve the issues encountered in the old attendance system while reproducing a brand new innovative smart system that can provide convenience to the institution.

In this project, an application will be developed which is capable of recognising the identity of each individuals and eventually record down the data into a database system.

Apart from that, an excel sheet is created which shows the students attendance and is directly mailed to the respected faculty. Also mail is sent to absentee's parents.

1.8 Moto of the project

To build a system which can mark attendance of many number of students at a time, or within a single capture to spot and mark attendance of students in a group irrespective of background. This was achieved by using machine learning and python. We also have authentication step which makes system only accessible for authorized users.

CHAPTER-2

LITERATURE SURVEY

2.1 Existing System

As we know The expansion/growth of machine learning, artificial intelligence and iot has picked-up the totality of technology growth. Traditional attendance marking techniques i.e, pen and paper or signing attendance sheets are easy to bypass and trick as giving proxies or false signatures is a common practice among students nowadays, students take an unfair advantage of this at most times. But a facial recognition system cannot be fooled as each person has a set of unique and individual features common to that person and cannot be replicated or changed, it all comes down to one simple truth that is, unless you are physically present in the lecture your attendance will not get marked. This study mainly concentrates on the different facial recognition methods that were proposed by different authors and to crack the deformity that caused less accuracy of the system.

Existing System	**Limitations**
1. Pen and paper	False signatures and proxies
2. Biometric, Fingerprint	Costlier approach
3. RFID tags	Lack of guarantee(can be used by anyone)
4. Computer vision algorithms	Lacks Accuracy

2.2 Survey Papers

The use of face recognition technique has been growing rapidly in the past few years in the areas of law enforcement, biometrics, security, and other commercial sectors but very little has been done to apply this technology in the field of education, which became the main basis for this study. Face recognition does not always give a hundred percent accuracy rate but when compared to other biometric forms this has been proved to be the better option.

2.2.1 Automated Attendance Management System based on Face Recognition Algorithms- Shireesha Chintalapati, M.V. Raghunadh

Proposed system: an automated attendance management system based on face recognition algorithms which say, when a person enters the class room, his image is captured by the camera at the entrance. Only Face region is considered and then extracted for further process.

Finally after flashing on to student's face, it is then fed to post-processing. Out of many methods they have chosen Viola-Jones detection algorithm considering its high detection rate, which makes use of Integral Image and AdaBoost learning algorithm as classifier and they have combined multiple haar classifiers to get better detection rates up to an angle of 30 degrees.

Haar cascade is basically based on the Haar Wavelet technique to analyse pixels in the image into squares by function. This uses machine learning techniques to get a high degree of accuracy from what is called "training data". This uses "integral images" concepts to compute the "features" detected. The training data used in this project is of an XML file called. And they have used OpenCV Haarcascade method to load the haarcascade_ trained faces which is of text form as the classifier. The classifier outputs a "1" if the region is likely to show the object (i.e., face), if not "0".

Biometric features is been implemented to process database of 80 individuals (NITW-database) with 20 images of each. Principal Component Analysis (PCA) was also considered for the feature extraction so that necessary dimensions of an image will be achieved. As PCA was not considering the discriminative information in the data, Linear Discriminant Analysis (LDA) was proposed, where it maximizes the ratio of the scattering. To manage the accuracy of the system from switching of database size, Latterly Local Binary Pattern Histogram (LBPH) was introduced. It is a basic algorithm that's used to detect faces from front side. The LBP operator divides the face in the image into pixels. Every pixel is associated with 8 neighbour pixels that's surrounding it. Then Each pixel value is compared with the surrounding neighbour pixel values.To overcome Mocking in the system anti-spoofing technique like eye blink detector is been included which maintains its accuracy despite changes in the facial pose.

The main disadvantage of this system is, only two persons are allowed to enter the classroom at a time. However this technique proved to be time saving and secured, if a person poses any unintentional changes the recognition rate will gradually low down. This system can only concede a person's face up to 30 degrees angle variations, which is a drawback. This proposed system lacks accuracy.

2.2.2 Attendance Management System using Face Recognition- Suman Kumar Jha, Aditya Tyagi, Kundan Kumar, Madhvi Sharma

Proposed system: Proposed a different technique with LBPH algorithm and Haar Cascade Classifier. It cuts the depiction into pixels, each pixel is held by eight nearest pixels. To gain high degree of accuracy Haar Cascade Classifier was implemented.

Let's have an insight of the application, it holds some 3 operations:

1. For adding new student: i. Enter roll number in roll number field. ii. Enter name in name field. iii. Then take image. iv. Image is capturing through the camera. v. Image is processed and converted to greyscale, then stored in database.

2. For attendance of students i. Click automatic attendance button. ii. Input subject name. iii. Image is capturing through the camera. iv. Image is comparing to registered students. v. If face is match then attendance will be marked for that subject with date and time of that student.

3. For checking registered students. ii. They were supposed to enter admin id and password. iii. Then were directed to login. iv. Registered students details were shown.

Disadvantage of this system be requisition of high processing power, reduced accuracy/quality of image as some images possess noise. It also restricts number of students.

2.2.3 Development of Facial Recognition System with Email Identification message relay mechanism- Kennedy Okokpujie, Etinosa Noma-Osaghae, Samuel John, Rhema Oputa

Proposed system: came up with the attendance system that can take accurate class attendance records and minimize fraud using a facial recognition algorithm known as Fisherfaces or Fisher Discriminant Analysis (FDA). Fisherfaces basically works on the principle of intensity of images to recognize faces.

The Face recognition technology used here compensates for variations in orientation, illumination and scale by using the robust algorithm, Fisherfaces. The system implemented has a training database of ten students. Ten facial images of each student are taken with different composures, looks and under different levels of illumination. And it Tests on nine students in the database and yields to accuracy. Here, in FDA algorithm the facial recognition can be done in two ways: 1. Feature based method where, the facial image is processed and important facial features are identified, extracted and measured. 2. Holistic: In this method, faces are differentiated based on the overall outlook of the face and not on any one local facial feature.

Coming to the design of the system: camera was used to acquire facial images in real time. postgreSql was used to create the relational database. The FDA algorithm, which is written in optimized C, was obtained from OpenCV, which is an online library. Qt c++ was used to design GUI for the operation of commands like, capture, login, logout and create new student etc.

After all these adjacently follow the enrolment stage, before enrolling, required username and password were supposed to be filled. After logging in many items popped up on the main menu-

1. New student- which provides the page through which the particulars of particulars of new students were obtained. After saving, new pages enabled taking facial images and both were stored in the database.

2. List of all students- this gives the list of all students in the database. It also facilitates any student to see or edit his/her information

3. Configuration- where the settings for the email were configured. The email address given to receive the identification message was allowed to change here and smtp(simple mail transfer protocol) option was also provided. It has two divisions:

Identification stage- here the username and password were entered to begin the identification of students, after capturing the face, system immediately sends a message to administrator's email address, detailing the name, time and date, the person was identified

Email message- after identification, message saying name was matched by the facial recognition software on date identified was sent in real time to administrator's email address.

Finally an accuracy of min 70% and max 90% was obtained based on the system's data. This validates the proof that the more the number of training facial image in the database, higher the accuracy of Fisherfaces approach. The result was found capable of eliminating attendance fraud.

2.2.4 Android Attendance Management System using Face Recognition- Dulyawit Prangchumpol

Proposed system: Framework of Attendance Management System to increase the correction on conceding (face recognition) system, it holds five division first comes 1.Student registration, here face image was captured more than 10times with different expressions in

vertical form. Next comes, 2.Face diagnosis, author opted for Haar cascade technique, to achieve high degree accuracy and speedy evaluation. Further a program was developed for getting 3.Face result, which employs database to compare the face of the tester to data in system. 4. Cloud storage, data storage comes into picture after the identification of the system, and then the result will be sent and saved, for saving result Google cloud was employed as a database. Next comes Storage talk, here they have employed Google cloud for database. Finally after saving the recognized image, it is then loaded and the attendance will be marked and then it will be exported to the Google sheets.

Coming to the function, they deployed android face recognition technique also called deep learning for detection purpose. Linear discriminant analysis (LDA) was included to get fisherspace, identification is done by projecting a new face onto the fisher space, then KNN algorithm is applied for identification. Euclidean distance (ED) was included for morphometric measures, if facial points are obtained from image captured then further it selects few significantant distances between and computes.

Coming to the experimental setup classifier was used in attendance system for all courses in this semester. After all the stored images of the recognized images of the students who registered were saved, later was used to train the classifier. All face recognition technology comes to market with both pros and cons. Compared to other system, this technique might increase the accuracy rate gradually as the technique is associated with deeplearning.

After storing images of the students registered, classifier will be trained then it will be used in the system for some courses. The number of classifiers used was 25 subject testers, where deployed model possess 97% of accuracy rate. This study has the highest accuracy rate when compared to others.

2.2.5 Face Detection and Recognition using Viola-Jones Algorithm and Fusion of PCA and ANN

Proposed system: An efficient approach for face detection and recognition using Viola-Jones, fusion of PCA and ANN techniques. The performance of the proposed method is compared with other existing face recognition methods and it is observed that better accuracy in recognition is achieved with the proposed method

It employs methodology where recognition of human faces done by features derived from image, which is been implemented in two stages: 1. While detecting human face in an image by violaJones algorithm, 2. Recognizing the detected face by mixing two techniques Principle

Component Analysis and Feed Forward Neural Network. It employs Bio ID-Face-Database for the database. Datasets contains of grey level images holding high resolution of pixel and front view of face up to 23 different persons, dataset possess vast variety of illuminations, size, expressions depicting real world conditions.

The proposed method implement an efficient Face Detection and Recognition technique which is independent of variations in features like colour, hairstyle, different facial expressions etc. using Viola Jones algorithm, PCA and ANN

First comes the pre-processing of the easily accessible pixels, then follows detection process by the application of Viola-Jones algorithm, which shows the detection up to 45degrees rotation. Up to 2500 features were calculated by the help of haar classifiers, and was later reduced by cascading. Two classifiers will come into picture to enhance the speed of the process. Detected face is then resized to standard resolution of 100x100.

Main features of the face are identified by Voila-Jones algorithm marked by a bounding box and is used for deciding the nodes corresponding to the identified part of the face. The features extracted by Voila-Jones algorithm are represented as nodes and these nodes are joined to form a shape making sure that all nodes are connected, and the connected lines are named with reference numbers.

Subsequently identification of detected image using principle component analysis and artificial neural network algorithm follows. Basically PCA remoulds higher dimensional data to lower dimension.

In next stage i.e., Face Recognition, data will be vitalized by the help of ANN that was trained before. To aid ANN with fewer errors, Back Propagation was included. A hybrid approach combining AdaBoost and ANN was proposed to detect faces with the purpose of decreasing the performance time but still achieving the desired faces detecting rate.

For every database there was one ANN to be considered. Here in this paper the considered human faces for database were 23, so that many networks were created. Face descriptors/labels are used for the training purpose of ANN. If label belongs to the same person for respective network, then it is considered to be positive example, which outputs to 1. If not it outputs to 0. Calculated face labels of test image from Eigen faces will be taken as input to networks, then proceed to dissemble. Now , put-on simulated results for comparison, if the result is greater than the predefined threshold level, that assures test image belongs to

the recognised person. Output is then sent to Face Tagging, to tag name of the recognised person.

On final note this system show-up highest accuracy rate of recognition among the reviewed papers. Individually PCA has 72% of accuracy and ANN has 92%, but the proposed system with Viola-Jones Algorithm, Artificial Neural Networks and PCA shows up the accuracy rate of 94%.

2.2.6 Smart Attendance Management System Using Face Recognition- Kaneez Laila Bhatti, Laraib Mughal, Faheem Yar Khuhawar, Sheeraz Ahmed Memon

Proposed system: a Smart Attendance System, with deep learning where the system is capable of identifying multiple faces in real time. This system uses face recognition approach to reduce the flaws of existing system with the help of machine learning. It was designed for automating the attendance of the different organization and to reduce the flaws of existing manual system. This system calculates the attendance subject wise. They have used Histogram of oriented gradient for face detection and deep learning techniques to compare and calculate features for recognition. Once faces are detected with the existing database, system calculates attendance for the recognized students with the respective subject id in real time. And an excel sheet will be generated and saved by the system automatically.

System splits into two parts, first the front end side which consist of GUI which is based on Electron JS that is JavaScript stack which serves as a client and the second is the backend side which consist of logic and based on Python which serves as a server. As we know that both the languages cannot communicate with each other directly, they have used IPC (Inter Personal Communication) techniques with zero libraries as a bridge to communicate these two languages. The Electron JS call the python functions and interchange data via TCP with help of Zero PC Library.

The face recognition process is as follows:

1. Face Detection and Extraction - Face detection algorithm applies to identify the human faces in that image, the number of image processing algorithms are introduced to detect faces in an image and also the location of that detected faces, they have used HOG method to detect human faces in given image, Histogram of Oriented Gradients, is a feature descriptor that is often used to extract features from image data. It is widely used in computer vision tasks for object detection.

2. Face Positioning - There are 68 specific points in a human face. The main function of this step was to detect landmarks of faces and to position the image. A python script is used to automatically detect the face landmarks and to position the face as much as possible without distorting the image.

3. Face Encoding - Once the faces are detected, next step is to extract the unique identifying facial feature for each image. Basically whenever we get localization of face, the 128 key facial point are extracted for each image given input which are highly accurate and these points are stored in data file for face recognition.

4. Face matching -Here if the current image was matched with the 60% threshold with the existing dataset then it's a match and, it will move to attendance marking.

Once the face is identified with the image stored in JSON file, python generate roll numbers of present students and return that, when data is returned, the system generates attendance table which includes the name, roll number, date, day and time with corresponding subject id. And then passes the data to python to store the table into an excel sheet automatically. Each sheet is saved according to the subjects which already entered by the administrator.

Coming to result this system's performance is satisfactory. The system accuracy effects as the variation in angle increases. This system needs to be improved, because these systems sometimes fail to recognize students from some distance, also it has some processing limitation.

CHAPTER-3

PROPOSED SYSTEM

3.1 Proposed System

The main aim of our system is to extract the face of the student and perform comparison with the data stored in prior in our system. The system also authenticates the user that prevents the trespasser to operate it.

The face of the student is captured in such a way that all characteristics of student is identified uniquely and even the position of them is identified separately.

By using this system, manual attendance is not necessary as the system captures the image through the camera attached to the computer. By further procedures, the data is changed or updated.

3.2 Algorithm

3.2.1 LBPH for face recognition (Local Binary Pattern Histogram) :

Step 1: parameters : LBPH uses 4 parameters:

- Radius
- Neighbours
- Grid X : cells in horizontal direction.
- Grid Y : number of cells in vertical direction.

Step 2: Training the algorithms.

Step 3: Applying the LBP operation.

- Intermediate images creation

Step 4 : Extracting the histograms.

Step 5: Performing the face recognition Euclidean distance ,

$$D = \sqrt{\sum_{i=1}^{n}(hist1_i - hist2_i)^2}$$

3.2.2 Haar cascade for Face Detection:

- Haar-feature selection
- Creating an integral image

- Ada boost training
- Cascading classifier

3.3 Design of the Proposed System

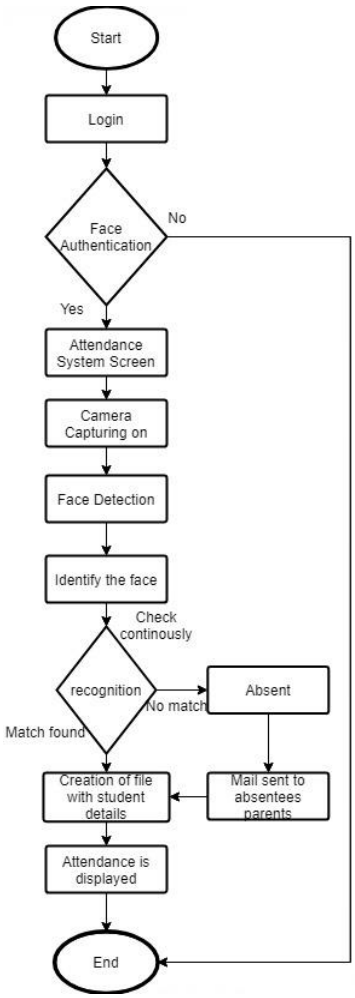

Figure 3.1: Flow Chart of the Proposed System

Figure shows how the proposed system is designed. After loging in if the face authentication is done then it moves to attendance system screen or else it will directly come out the system.

3.4 Advantages of the proposed system

- High detection accuracy
- Shorter training time

CHAPTER-4

SYSTEM REQUIREMENT SPECIFCATION

4.1 Software Requirements

- **Operating system :** 64-bit OS Windows 10.
- **Programming Language :** Python, mysql.
- **Technology** : Face Recognition.
- **IDE :** anaconda-spyder.

4.2 Hardware Requirements

- web cam.
- x64 based processor.
- RAM 4GB.

4.3.1 Web Cam

Figure 4.1: Webcam

A webcam is a small digital video camera directly or indirectly connected to a computer or a computer network.

Webcams come with software that needs to be installed on the computer to help users record video on or stream it from the Web. Webcams are capable of taking pictures as well as high-definition videos, although the video quality can be lower compared to other camera models.

Webcams are also known as Web cameras.

The camera and video resolution increases as the number of pixels increase; meaning: the higher the resolution, the higher the image quality. High Definition Webcams: high definition webcams can also be divided into two types: the first is 720 pixels (720x1280 pixels), and the second is 1080 pixels (1080x1920 pixels).

4.3.2 Processor

A 64-bit processor is a microprocessor with a word size of 64 bits, a requirement for memory and data intensive applications such as computer-aided design (CAD) applications, database management systems, technical and scientific applications, and high-performance servers. 64-bit computer architecture provides higher performance than 32-bit architecture by handling twice as many bits of information in the same clock cycle.

The 64-bit processor is backwards compatible with older applications and operating systems; it detects whether an application or operating system is 16-bit, 32-bit, or 64-bit and computes accordingly. This is essential for enterprise situations where purchasing new software is not feasible.

Intel, IBM, Sun Microsystems, Hewlett Packard, and AMD currently develop or offer 64-bit processors.

4.3.3 RAM

Figure 4.2: RAM

RAM is the amount of main memory that computer programs have available to use. A computer with 4GB of RAM means that it has approximately 4 billion bytes of memory for programs to use. But more RAM doesn't mean your programs will run faster, only that can run more programs at the same time.

4GB of RAM has been standard for a few years now but mainstream computers have been moving into 8GB territory. Higher end laptops and gaming PC's are now even using 16GB.

4.4 Software Requirements

4.4.1 OpenCV

Figure 4.3: OpenCV

OpenCV is the huge open-source library for the computer vision, machine learning, and image processing and now it plays a major role in real-time operation which is very important in today's systems. By using it, one can process images and videos to identify objects, faces, or even handwriting of a human. When it integrated with various libraries, such as Numpy, python is capable of processing the OpenCV array structure for analysis. To identify image pattern and its various features we use vector space and perform mathematical operations on these features.

4.4.2 Spyder-Python

Figure 4.4 : Spyder-Python

Spyder is an open-source cross-platform integrated development environment (IDE) for scientific programming in the Python language. Spyder integrates with a number of prominent packages in the scientific Python stack, including NumPy, SciPy, Matplotlib, pandas, IPython, SymPy and Cython, as well as other open-source software. Features are:

- The ability to explore and edit variables from a GUI
- Project support, allowing work on multiple development efforts simultaneously

4.4.3 Mysql

Figure 4.5: Mysql Logo

MySQL is a relational database management system based on SQL – Structured Query Language. The application is used for a wide range of purposes, including data warehousing, e-commerce, and logging applications. To add, access, and process data stored in a computer database, you need a database management system such as MySQL Server.

The most common use for MySQL however, is for the purpose of a web database. It can be used to store anything from a single record of information to an entire inventory of available products for an online store.

In association with a scripting language such as PHP or Perl (both offered on our hosting accounts) it is possible to create websites which will interact in real-time with a MySQL database to rapidly display categorised and searchable information to a website user.

4.4.4 Tkinter

Tkinter is the standard GUI library for Python. Python when combined with Tkinter provides a fast and easy way to create GUI applications. Tkinter provides a powerful object-oriented interface to the Tk GUI toolkit.

Creating a GUI application using Tkinter is an easy task. All you need to do is perform the following steps −

- Import the Tkinter module.
- Create the GUI application main window.
- Add one or more widgets to the GUI application.
- Enter the main event loop to take action against each event triggered by the user.

4.4.5 Simple mail transfer protocol lib

Simple Mail Transfer Protocol (SMTP) is a protocol, which handles sending e-mail and routing e-mail between mail servers.

Python provides smtplib module, which defines an SMTP client session object that can be used to send mail to any Internet machine with an SMTP or ESMTP listener daemon.

Here is the detail of the parameters −

- host − This is the host running your SMTP server. You can specify IP address of the host or a domain name like tutorialspoint.com. This is optional argument.

- port − If you are providing host argument, then you need to specify a port, where SMTP server is listening. Usually this port would be 25.
- local_hostname − If your SMTP server is running on your local machine, then you can specify just localhost as of this option.

An SMTP object has an instance method called sendmail, which is typically used to do the work of mailing a message. It takes three parameters −

- The sender − A string with the address of the sender.
- The receivers − A list of strings, one for each recipient.
- The message − A message as a string formatted as specified in the various RFCs.

4.5 Functional Requirements

- Proper working of web cam.
- Good internet connection
- Proper authentication
- should be able to recognize the face.
- After detection and face recognition, data should be stored in the database.
- When attendance is required then data stored in the database should be displayed.

4.6 Use Case Stories

4.6.1 Use Case 1: Login stage

User should be able to give proper user name and password to get into the system.

Acceptance Criteria: proper user credentials are required.

Dependencies: Database .

Risks/Suggestions: there are chances of blank field.

Implementation Details: Comparing of entered data to the data stored in database

4.6.2 Use Case 2: Face Authentication

User should be authenticated.

Acceptance Criteria: Face of the person.

Dependencies: Training images of face of person .

Risks/Suggestions: There are chances of valid authenticated person denied of permission.

Implementation Details: Comparing face of the person with the training images.

4.6.3 Use Case 3: Face Recognition and Attendance

User should be able to recognise the faces of students and attendance must be taken

Acceptance Criteria: Student's face

Dependencies: Training images and Database.

Risks/Suggestions: Chances of Present students being marked as absent.

Implementation Details: Using LBPHfacerecogniser_create()

4.7 Non-functional Requirements

4.7.1 Internet

The system requires stable internet connection, as mail should be sent to parent's email-id of the absent student.

4.7.2 Simplicity

The system is very simple.

4.7.3 Ease of Management and Maintenance

The system is very easy to manage and easy to maintain.

4.8 Features Requirements

Feature requirements are those set of requirements which have to be implemented so as to it works efficiently and in a hassle-free way.

4.8.1 Live face detection

A conventional face identification system can be easily cheated by placing a photo of another person in front of the camera. So system must only detect and recognise live face of person and not there photo

4.8.2 Identification capability

System functions must be used in 1-to-1 matching (verification), as well as 1-to-many mode(identification).

4.8.3 Fast Face matching

The system must compares and matches the speedily and accurately. Algorithm must compares 100,000 faces per second

4.8.4 Fast Attendance Marking

The attendances must be marked accurately and in fast manner.

4.9 User Characteristics

There is always multiple users categorised as faculties and students. These users are provided with their own credentials(username and password).

4.10 Use Cases

4.10.1 Use cases table

USE CASE ID: 01	**USE CASE NAME:** Faculty Login portal
ACTOR(s) : Faculties(more than one)	
PRE-CONDITIONS : User name and password	
MAIN COURSE OF ACTION : Entering that credentials and should move to face authentication	

USE CASE ID: 02	**USE CASE NAME:** Face Authentication
ACTOR(s) : Faculties(more than one)	
PRE-CONDITIONS : Faculty's face	
MAIN COURSE OF ACTION : The face must be recognised and authenticated. If authorised, then user can login to the system	

USE CASE ID: 03	**USE CASE NAME:** Face Recognition and Marking Attendance
ACTOR(s) : Faculties(more than one)	
PRE-CONDITIONS : Student's face	
MAIN COURSE OF ACTION : The face must be recognised.If student is present then	

attendance is marked as present else marked as absent and email sent to their parent's mail-id

USE CASE ID: 04	**USE CASE NAME:** Student Portal
ACTOR(s) : Students	
PRE-CONDITIONS : Students credentials(Roll_no and Password)	
MAIN COURSE OF ACTION : The window consisting of their details open if their credentials are correct.	

CHAPTER-5

SYSTEM DESIGN

5.1 Architecture

Face Detection and Recognition :

- ✓ Creating Dataset: In this step we are going to create a dataset of 21 images for each student one by one. This step may broadly be termed as the image capturing stage of the system.
- ✓ Here in order to detect the faces i.e. to bound the face of the person in rectangular shape we will use a 'Cascade Classifier' in the form of a xml file. By default we are going to use 'haarcascade_frontalface_default.xml' in the following manner.
- ✓ Face Detect=cv2.CascadeClassifier('haarcascade_frontalface_default.xml');
- ✓ cam=cv2.VideoCapture(0); // Enabling default webcam to capture image
- ✓ Now distinguishing each user with an Id a dataset can be created in the following way. Also all the images will be first converted in the Gray Scale format so that during training and recognition of the image no ambiguity would appear due to the colour of a particular image.

1) Training Dataset: In this step we are going to feed the data and respective names of each face to the recognizer. In this way it can learn about all the images with corresponding ids.

2) Recognition of Images: In this step we are going to feed the new faces of the same user and see if the face recognizer we just train can detect them or not. For recognition of images we are using LBPH algorithm.

3) Feature Extraction: based on the trained dataset, the system is capable of extracting the face part and recognizing, soon after which the person's name will be popped up. Later the updation of the attendance in database will be done.

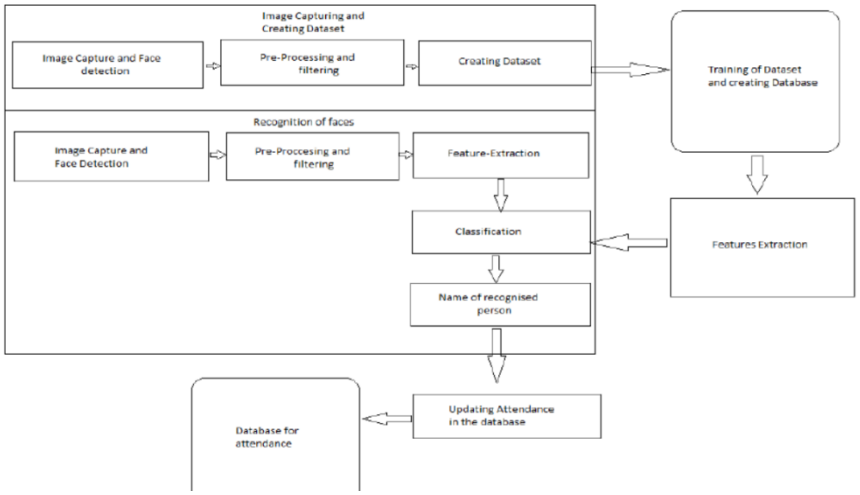

Figure 5.1: Architecture of the System

5.2 Design of the Proposed system

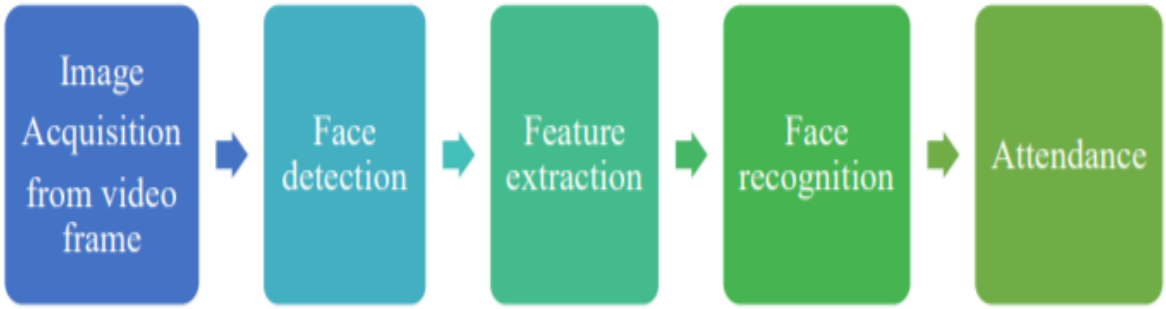

Figure 5.2 : Design of the system

The proposed model is based on face recognition mechanism. The basic methodology is presented in the above figure. Whenever a student enters the class and comes across the camera module of the system his image is captured in the system and is recognized and validated if he is a student of the class. If recognized then his attendance is automatically marked via post processing of the system.

- ➔ The proposed approach provides a method to identify the individuals by comparing their input image obtained from recording video frame with respect to train image during the respective semesters registration process.

- ➔ The proposed approach provides a method to identify the individuals by comparing their input image obtained from recording video frame with respect to train image during the respective semesters registration process.

➔ The proposed approach provides a method to identify the individuals by comparing their input image obtained from recording video frame with respect to train image during the respective semesters registration process.

5.3 Sequence diagram

UML sequence diagrams are interaction diagrams that detail how operations are carried out. They capture the interaction between objects in the context of a collaboration. Sequence diagrams are time focus and they show the order of the interaction visually by using the vertical axis of the diagram to represent time what messages are sent and when.

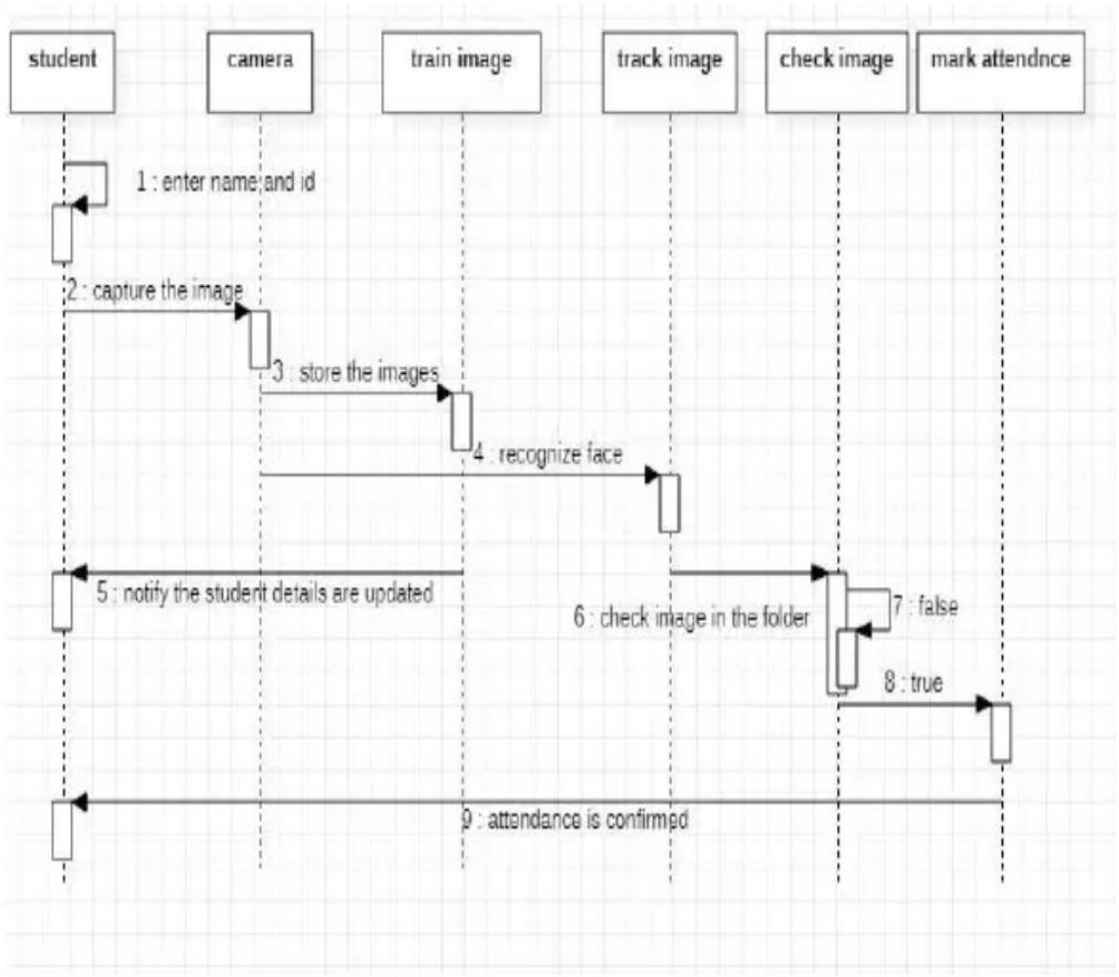

Fig 5.3: Sequence Diagram

- The proposed system has been designed to keep it pretty straightforward and easy to understand.

- The steps that have to be undertaken to reach the final end step of the system which is making sure the attendance of the student is updated correctly and timely.
- The system can easily be accessed by anyone, where attendance of the students can easily be checked and maintained by the faculty as when required.
- The DroidCam app will allow easy use for capturing live video feeds of the class and simultaneously perform recognition for the students.
- OpenCV-Python will be used to access the Haar Cascade and LBPH algorithms and their libraries that are required for training, recognition and matching of the captured images against the stored images available in the previously acquired data sets.

5.3.1 user-desktop application

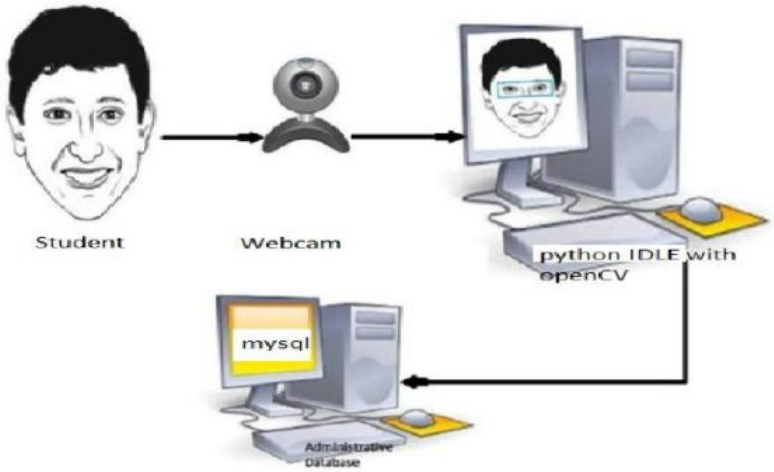

Figure 5.4: User-desktop application

5.4 Data Flow Diagram

A data flow diagram (DFD) maps out the flow of information for any process or system. It uses defined symbols like rectangles, circles and arrows, plus short text labels, to show data inputs, outputs, storage points and the routes between each destination.

Images from a live stream are passed as input to the system. These images are converted to greyscale as LBPH works with images in greyscale. From the greyscale images features of the face are extracted. Features refer to the gradients in the face. The features are then compared with existing records to check if there is a match. If the face matches it is displayed and output is in the form of attendance being marked for the person whose face was recognized. The below figure explains the flow of data.

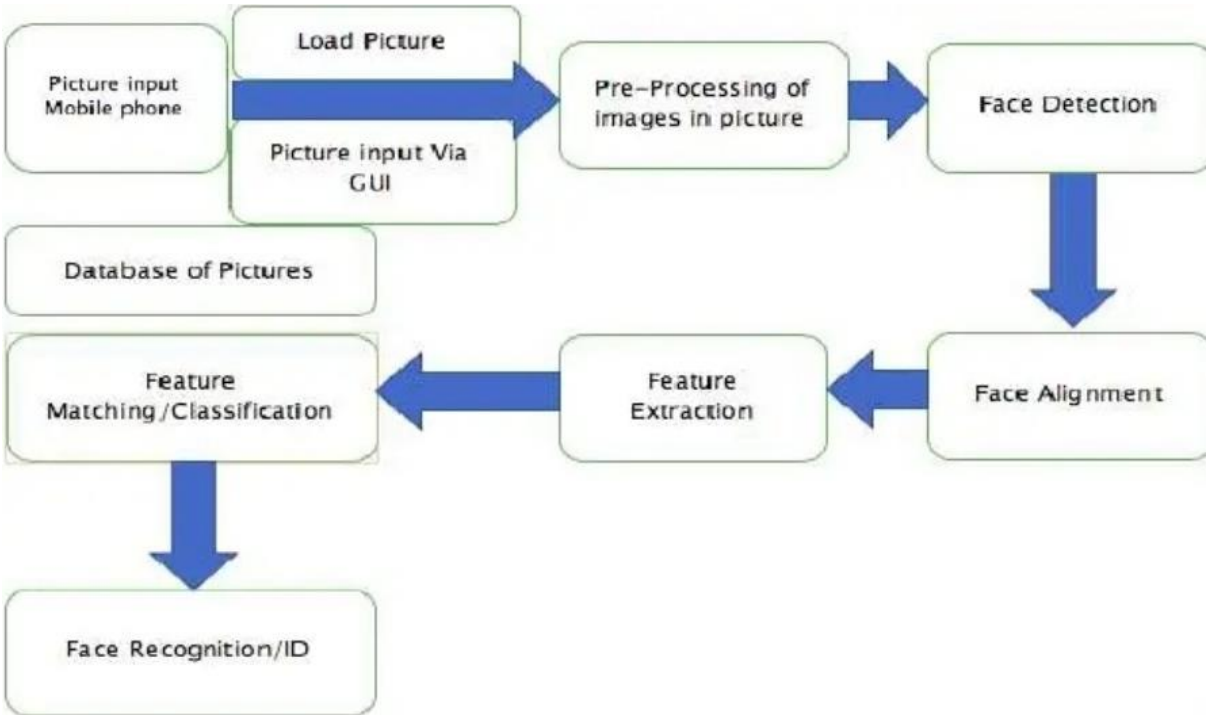

Figure 5.5: Data Flow Diagram

As shown, the camera first takes the input faces of the user by detecting the faces and the other information also and then save them in a directory, then the image data-set are given as input to our image training system, where the images are trained and a trained file is created, and if the user comes again in front of camera, the face is detected and identified and the corresponding data is sent to the database and the attendance of that user is also marked, further the users can check their attendance on the web-page after logging into their account.

5.5 Use case Diagram

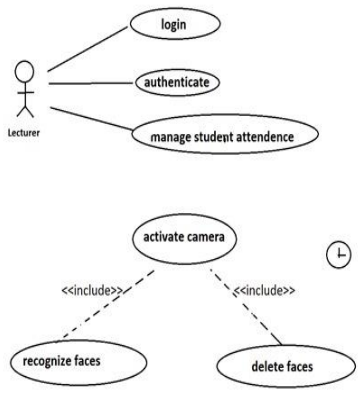

Figure 5.6: Use case Diagram

- The use cases and actors in use-case diagrams describe what the system does and how the actors use it, but not how the system operates internally.
- Use-case diagrams illustrate and define the context and requirements of either an entire system or the important parts of the system.
- The case diagram shows the set of actions that were performed by the system and how it interacts with all users of the system.
- The case diagram shows the set of actions that were performed by the system and how it interacts with all users of the system.
- It can be referred to as the blueprint of the system.

CHAPTER-6

IMPLEMENTATION

6.1 Faculty Login Screen

This is the first screen that appears. This is Faculty Login portal so the users are faculties. Here users need to enter their credentials i.e. username and password. There are few buttons. They are:

a. Login
b. Register User
c. Close

6.1.a. Login

After entering of credentials, user enters Login button. If the credentials matches with the data stored in data base message with “Login Successful” is displayed and face authentication screen appears. If the credentials doesn’t match or any one is not entered then message with “Enter the data properly” is displayed.

6.1.b. Register User

This screen is used to register new user .User needs to enter the username and password they want to use for the system. Then register button is pressed .The username and password is stored in database. Thus, new user is created.

6.1.c. Close

This button is used to completely logged off from the system.

6.2 Face Authentication

This module is used as lectures’ verification module. This prevents the system from being open from trespassers. Face Authentication module is implemented using LBPH (Local Binary Pattern Histogram) and Haar-cascade algorithm. If the user is authorized then message saying “

6.3 Attendance Screen

After face authentication and if the user is authorized attendance screen is opened. The various options available in the attendance screen are.

a. Create Dataset
b. Train face dataset
c. Recognize face and set attendance
d. Generate attendance sheet
e. Add
f. View Details
g. Delete
h. Update
i. View Attendance

6.3.a Create Dataset

This button helps to capture training pictures of the students. 51 images of the student are captured continuously. These pictures are stored in file named "dataset". These images are used for extracting features to identify the user. The user needs to enter the id for storing the student's training images as an input . The images names are stored in the format "User.id.number" ,where number ranges from 0 to 50.

6.3.b Train face dataset

Here, the unique features from each image are extracted and stored in accordance with the id that was entered by the user while creating dataset. This uses Haar-cascade algorithm. After extraction of features, it is stored in the form of matrix and stored in the file of .yml format.

6.3.c Recognise face and set attendance

When the user enters this button, web camera is activated and starts capturing. If any faces are detected, then a rectangle box appears around the face. Face is recognised using LBPH algorithm. If the face is trained or recognised, then name related to the face appears below the rectangle box appears, else Cannot recognise is displayed. These names are updated to the database and are tagged as Present in status column. For students whose faces are not present or recognised, absent notification mail is sent to their parent's email-id

6.3.d Generate attendance sheet

When the user clicks this button, the data from the database is extracted and .csv file is created under the present-day date and timings. The extracted data of students are then placed in this CSV file. This file is stored in the folder created month wise followed by year.

6.3.e Add

If the user wants to add students, then add button is clicked. The screen appears which consists of form to enter the new students details like Name, USN, Class, Status, Date, Parent Email_id. Then on clicking, add the details are added on to the database.

6.3.f View Details

If the user wants to view student details, then he can view by entering the student's enrolment number.

6.3.g Delete

If the user wants to delete student , then they can perform it by using the USN or Enrolment number of student.

6.3.h Update

The user can modify student's name or class just by entering the Enrolment of the student.

6.3.i View Attendance

If the user wants to view today's attendance, then he can click this button. This also gives the count of students absent, present and total strength at that time.

6.4 Student Login System

This is student part of the system. Students can login to the system using their Enrolment number as username and their name as password. The students can view their attendance status as well as update their details if either is incorrect. Students can modify either their class or their name.

6.5 Challenges faced

- Variation of accuracy in recognition of faces, when there is movement and variation of lights at the background.
- Data storing in the database table.
- Display of messages, when the credentials were wrong.

CHAPTER-7

SOFTWARE TESTING

7.1 Unit testing

Unit testing is the software development process in which smallest testable part of the application, called units are individually and independently scrutinized for proper operation. Therefore, the Online Attendance System using Machine Learning Algorithms is being tested and scrutinized with all its modules and units separately and has passed all tests well and fine.

7.2 Integration Testing

Integration testing(sometimes called integration and testing, abbreviated as I&T) is the phase in software testing in which individual software modules are combined and tested as a group. Therefore, the Online Attendance System using Machine Learning Algorithms by is divided into Faculty Login Portal, Face Authentication, Face Recognition, Attendance Generated, Add, View and Delete in faculty portal and Student Login Portal and Update in student portal.

7.3 Test Cases

TEST CASE NO: 01	**TEST CASE NAME:** Login Screen
INPUT: User credentials(Username and Password)	
OUTPUT: If credentials matches with data in database, displays Login Successful and continues to Face authentication.	
RESULT: PASS	

TEST CASE NO: 02	**TEST CASE NAME:** Login Screen
INPUT: User credentials(Username and Password)	
OUTPUT: If credentials does not matches with data in database, displays Wrong credentials and system closes.	
RESULT: PASS	

TEST CASE NO: 03	**TEST CASE NAME:** Login Screen
INPUT: User credentials(Username and Password)	
OUTPUT: If one of the credentials are not entered, displays message to the user to enter it.	
RESULT: PASS	

TEST CASE NO: 04	**TEST CASE NAME:** Face Authentication
INPUT: Person's face	
OUTPUT: If the face is of authenticated user, system opens	
RESULT: PASS	

TEST CASE NO: 05	**TEST CASE NAME:** Face authentication
INPUT: Person's face	
OUTPUT: The system closes, as it is unauthenticated user's face	
RESULT: PASS	

TEST CASE NO: 06	**TEST CASE NAME:** Face recognition and Attendance Marking
INPUT: Person's face	
OUTPUT: Name of the person sitting in front of the webcam is played and status is updated to present from absent.	
RESULT: PASS	

TEST CASE NO: 06	**TEST CASE NAME:** Face recognition and Attendance Marking
INPUT: Person's face(Valid or face of person whose 50 sample images are used for training)	
OUTPUT: Name of the person sitting in front of the webcam is displayed and status is updated to present from absent.	
RESULT: PASS	

TEST CASE NO: 07	**TEST CASE NAME:** Face recognition and Attendance Marking
INPUT: Person's face(Invalid)	
OUTPUT: Cannot detect face is displayed, status doesn't change and absent notification is sent to the parent's email-id.	
RESULT: PASS	

TEST CASE NO: 08	**TEST CASE NAME:** Student Login Portal
INPUT: Student username and password(Valid)	
OUTPUT: Screen that displays users details and provides update option appears	
RESULT: PASS	

TEST CASE NO: 09	**TEST CASE NAME:** Student Login Portal
INPUT: Student username and password(Invalid)	
OUTPUT: Displays login error and logs out of the system	
RESULT: PASS	

TEST CASE NO: 10	**TEST CASE NAME:** Student Portal
INPUT: Student name or class	
OUTPUT: The given attribute value changes and is updated in the database.	
RESULT: PASS	

CHAPTER-8

RESULTS AND SNAPSHOTS

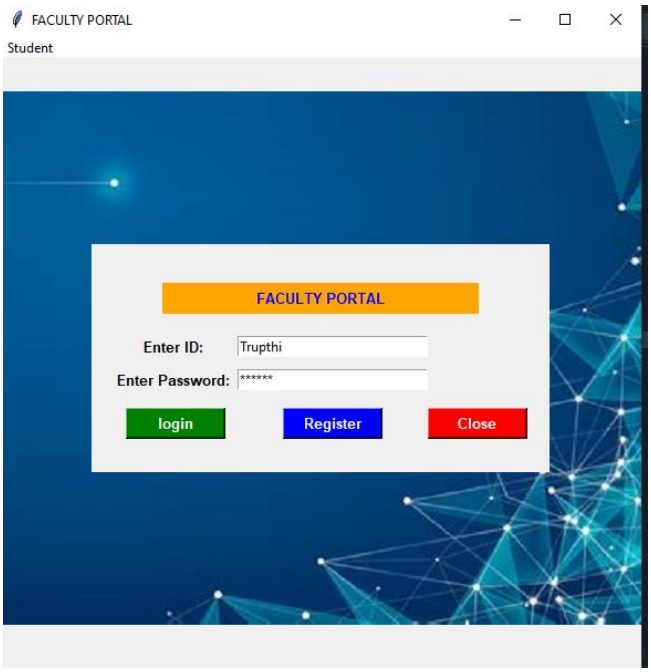

Figure 8.1: Faculty Login Portal

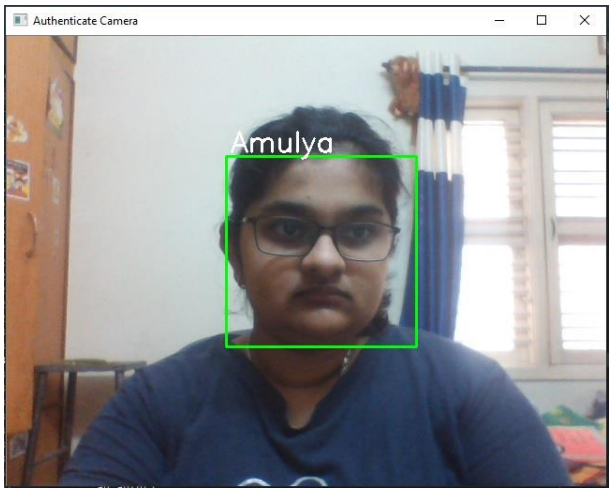

Figure 8.2: Face Authentication

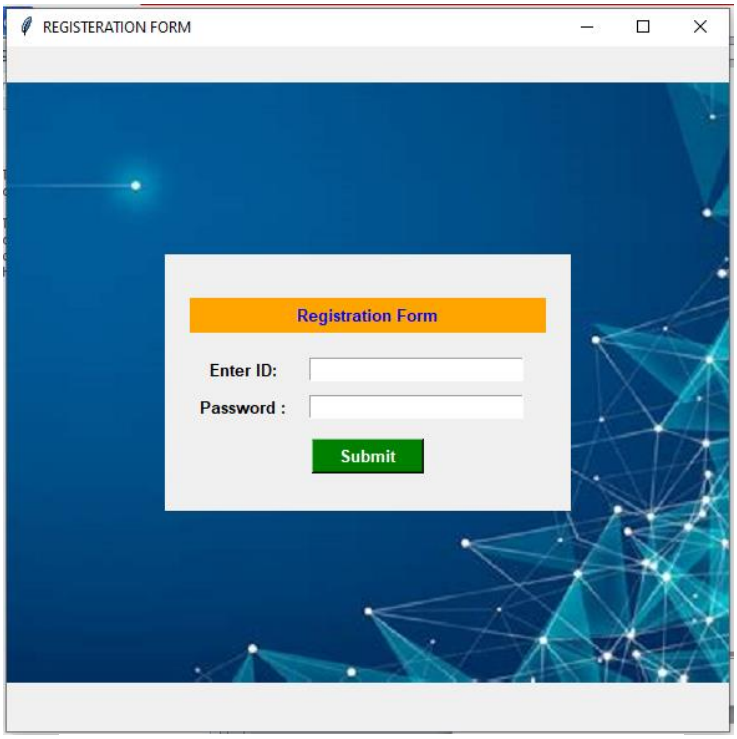

Figure 8.3: Faculty Registration form

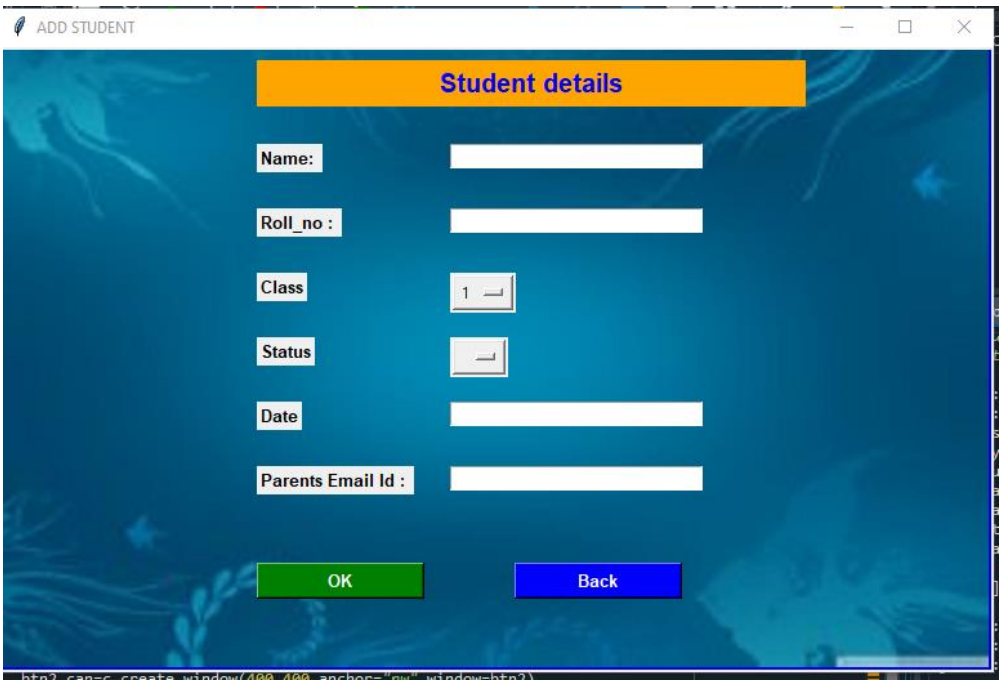

Figure 8.4: Attendance System Screen

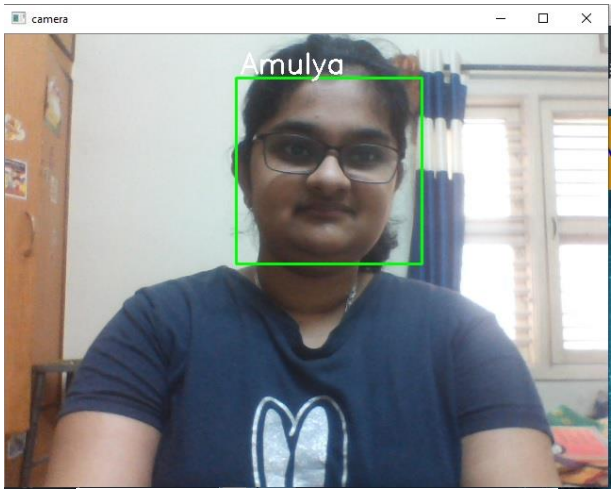

Figure 8.5: Face recognition

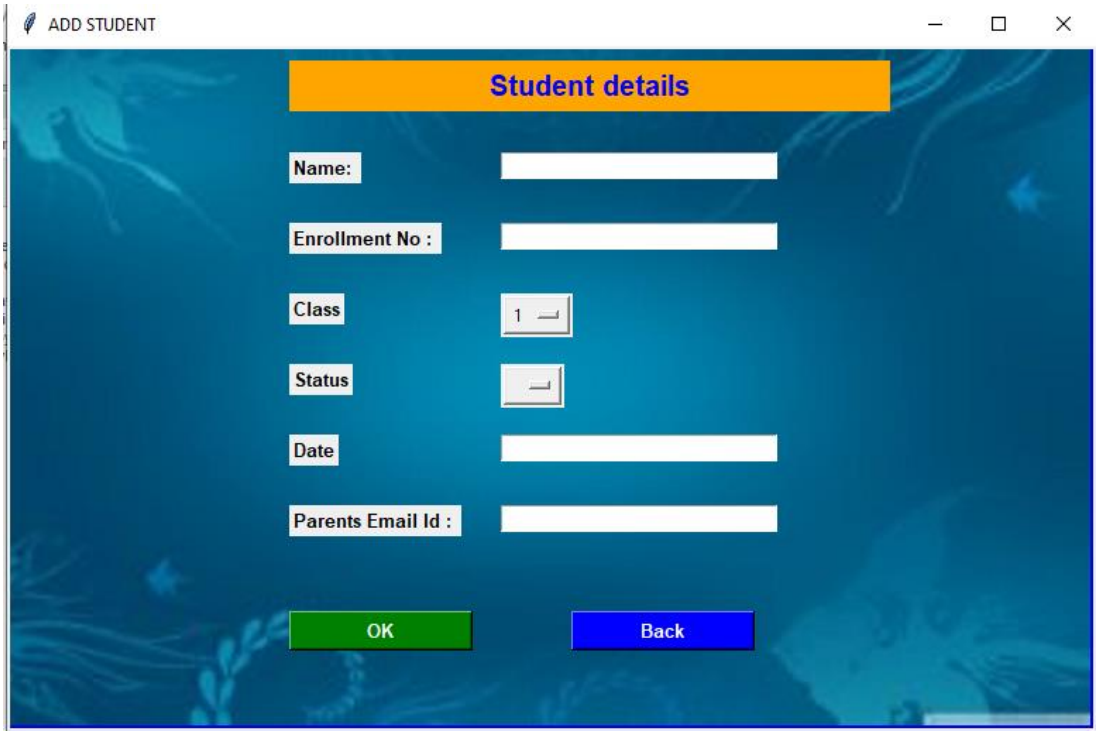

Figure 8.6: Add Student screen

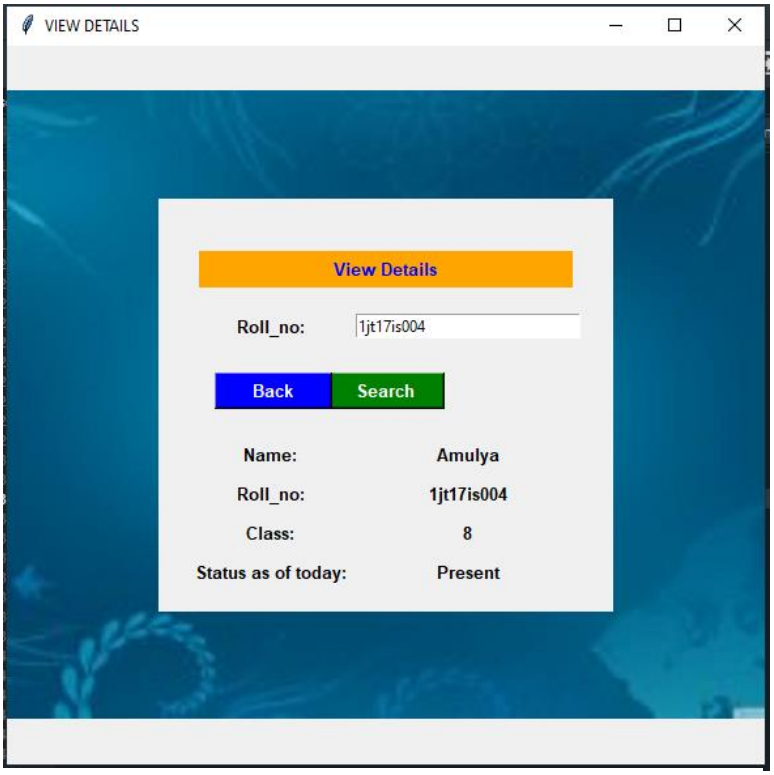

Figure 8.7: View Details Window

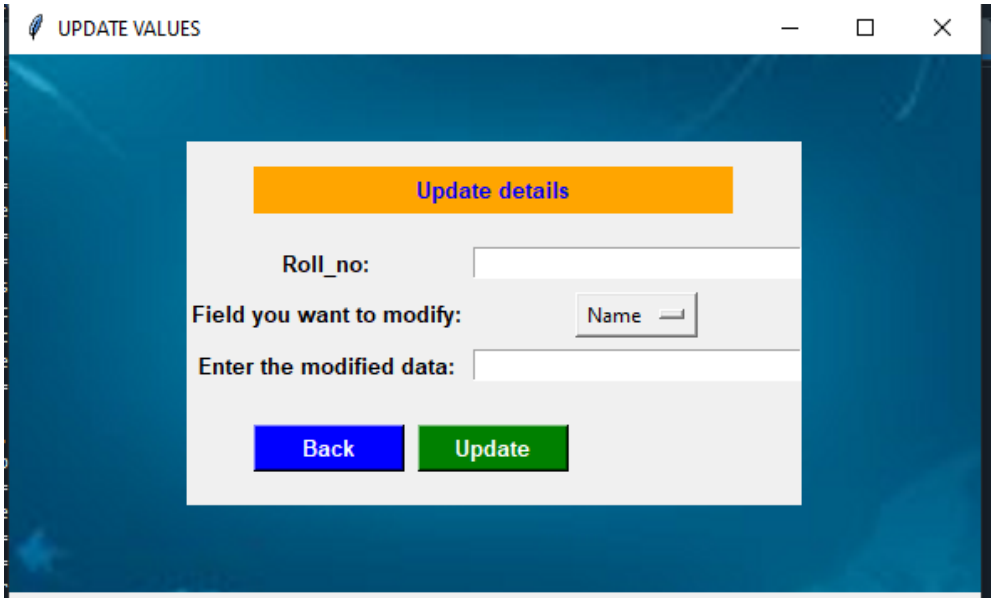

Figure 8.8: Update Student Window

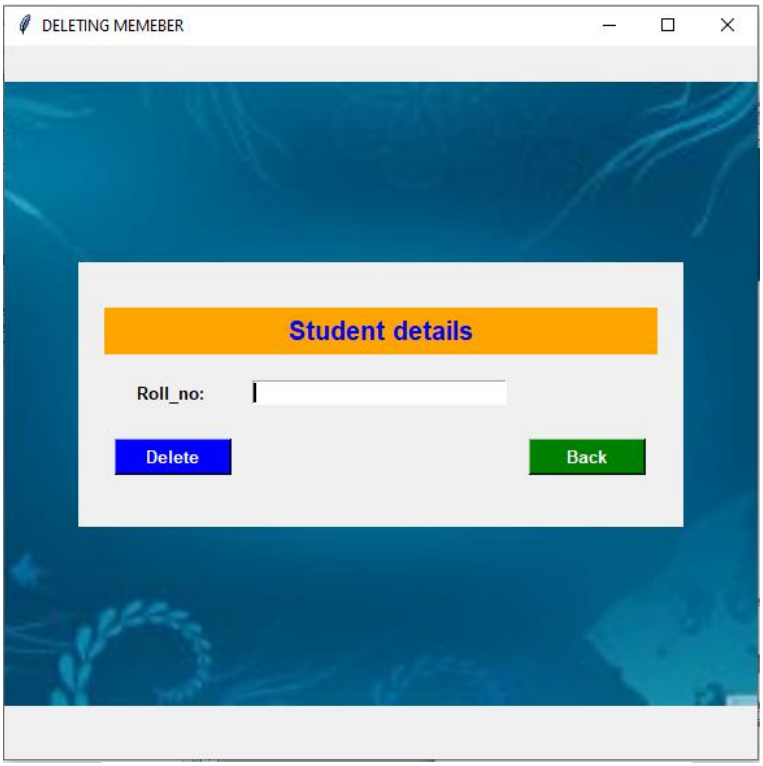

Figure 8.9: Deleting Student Window

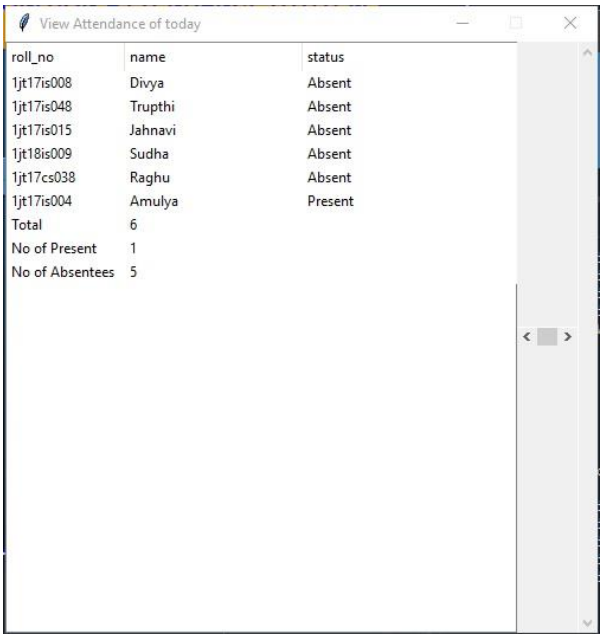

Figure 8.10: View Attendance of present day

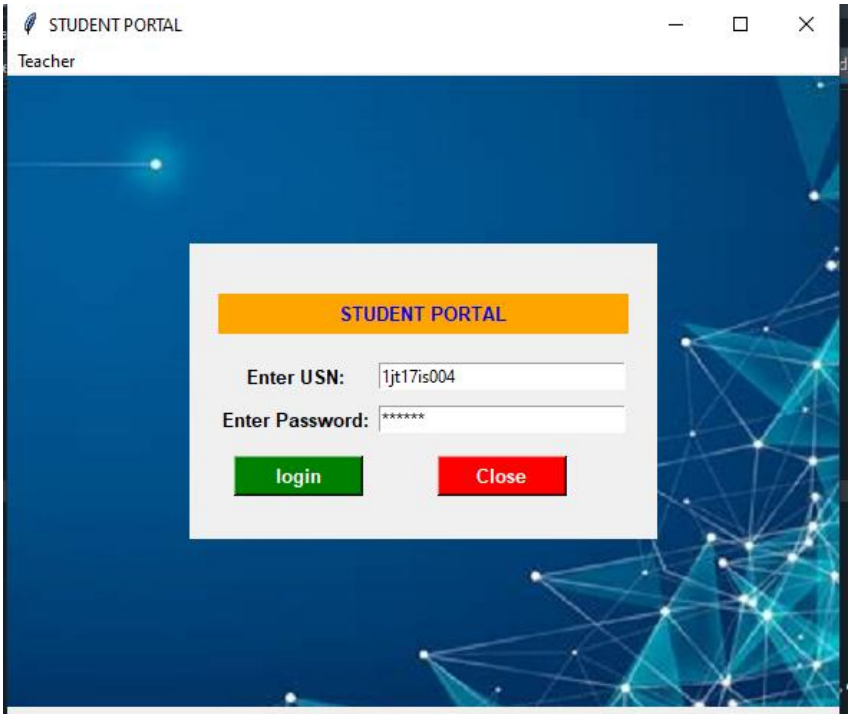

Figure 8.11: Student Login Window

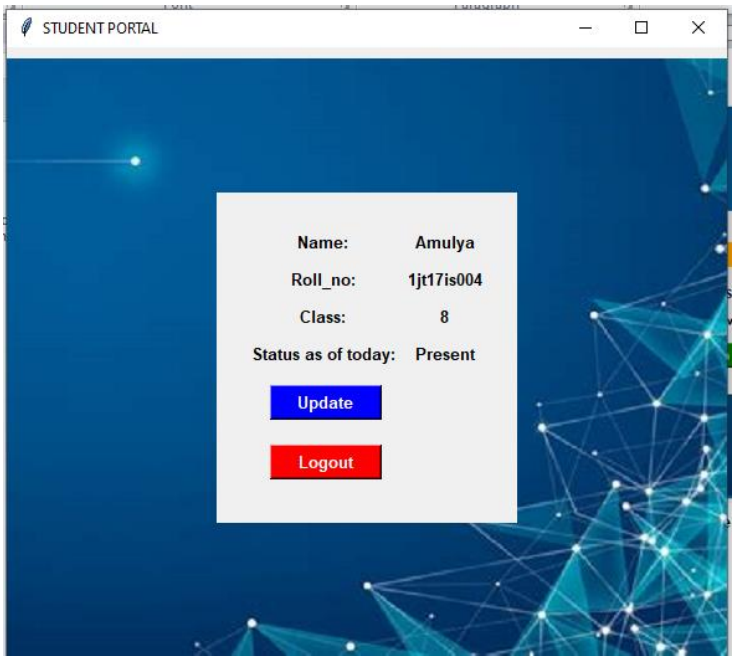

Figure 8.12: Student Detail Window

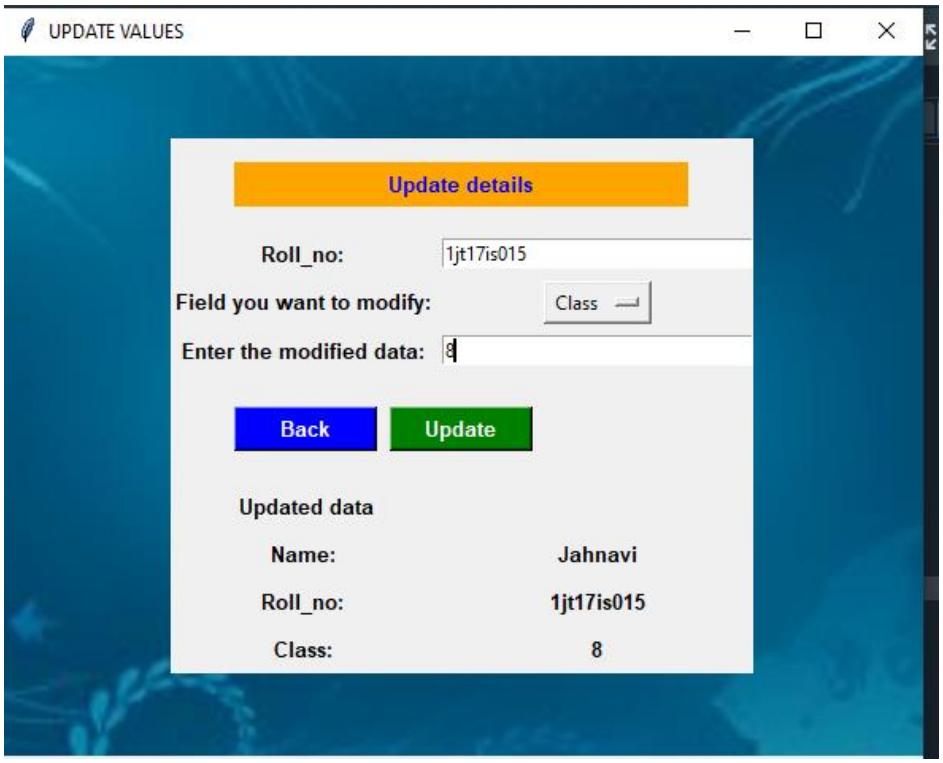

Figure 8.13: Updating the class of the candidate

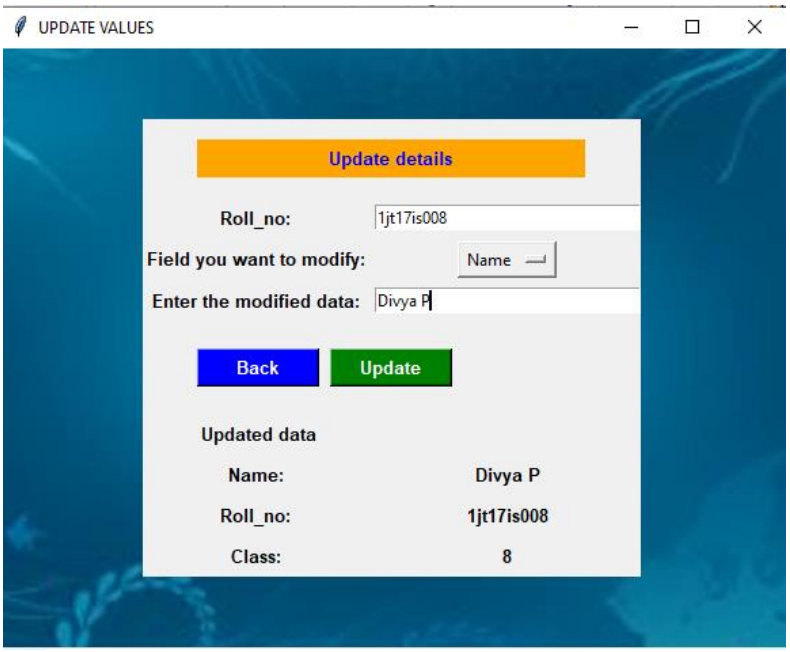

Figure 8.14: Updating the name of the student

CHAPTER-9

CONCLUSION

This system aims to build an effective ,reliable, secure, fast and an efficient attendance management system using face recognition techniques., replacing a manual and unreliable system. This system can be implemented for better results regarding the management of attendance.

The system will eliminate the attendance marking time and hence the faculties can concentrate on the topics to be taught, reduce the amount of work the faculties has to do and will replace the stationery material with electronic apparatus and reduces the amount of human resource required for the purpose. Hence a system with expected results has been developed but there is still some room for improvement.

Online Attendance System using ML algorithms is designed for the motive of reducing the mistakes that may occur during traditional attendance system. Face recognition is one of the easiest and comfortable method to incorporate in the attendance system. Several influential factors are there on which accuracy of separate algorithms vary on. This is a big challenge for class attendance system as it is employed in an uncontrolled environment. Compared with Eigenfaces and Fishers algorithms, LBPH algorithm has highest recognition accuracy in all experiments' with vary in lights, noises at every possible range. LBPH also has the highest impression of the negative light exposure and high noise level compared to other algorithms with statistical approach. Due to the highest accuracy obtained, LBPH algorithm is used as an face recognition algorithm in this system.

CHAPTER-10

FUTURE WORK

- This system can be improvised by making it to recognise students of the whole class accurately.
- This system can be attached to surveillance camera in such a way that the camera placed in a class captures the image of the whole class and recognises the students and awards attendances to available students. This reduces lot of efforts and time for teaching faculties.
- The system can be improvised in such a way that, absent students are notified through text messages.
- Usage of voice recognition authentication can increase the security of the system.

CHAPTER-11

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