Software Requirements Specification for Face Recognition Attendance System with Database Integration

Contents

1.INTRODUCTION

1.1 PURPOSE

Face recognition attendance system used to automate the attendance process and mark the attendance details of students. It can mark the time of lecture and daily presence of the individuals in a premise and generate detailed reports on the same at regular intervals.

The purpose of this system is to build a attendance system which is based on face recognition techniques. Here face of an individual will be considered for marking attendance.

The software can be used for different groups of people such as employees, students, etc. The system records and stores the data in real-time.

1.2 EXISTING SYSTEMS

At present, attendance, marking involves manual attendance on the paper sheet by professors and teachers, but it is a very time-consuming process and chances of proxy are also an issue that arises in such type of attendance marking. Also, there is an attendance marking system such as RFID (Radio Frequency Identification), Biometrics etc. But these systems are currently not that popular in schools and classrooms for students.

1.3 DRAWBACKS IN EXISTING SYSTEM

Manual systems put pressure on people to be correct in all details of their work at all times, the problem being that people aren't perfect, however, each of us wishes we were.

- These attendance systems are manual.
- There is always a chance of forgery (one person signing the presence of the other one) Since these are manually so there is a great risk of error.
- More manpower is required.
- Calculations related to attendance are done manually (total classes attended in a month) which is prone to error.
- It is difficult to maintain a database or register in manual systems.
- It is difficult to search for a particular data from this system (especially if that data, we are asking for, is of very long ago).
- The ability to compute the attendance percentage becomes a major task as manual computation produces errors, and also wastes a lot of time.
- This method could easily allow for impersonation and the attendance sheet could be stolen or lost.

1.4 SCOPE

The Scope of the project is as follows: -

- Enhances security and speed in tracing student attendance and lecture time.
- Easy to set up and use.
- Convenient and inexpensive.

- Helps in managing the time and attendance profiles of students.
- Eliminates proxy punching.
- Manages student attendance records.
- Easy to refer to the lecture time attendance record
- Easily configured according to your requirement.
- Reduces the manual student's data entry, register maintenance and monthly attendance percentage requirements.

1.5 Definitions, acronyms, and abbreviations

Some of the Acronyms and Abbreviation are mentioned below:

- LBPH - Local Binary Pattern Histogram
- PCA - Principal Component Analysis

2. OVERALL DESCRIPTION

2.1Product Perspective

"Face recognition is a broad challenge of verifying or identifying people in pictures or videos. Big tech giants are still working to make a faster and more accurate face recognition model."

2.2 Real-World Applications of Face Recognition

Face recognition is currently being used to make the world safer, smarter, and more convenient.

There are a few use cases:

- Finding Missing Person
- Retail Crime
- Security Identification
- Identifying accounts on social media
- School Attendance System
- Recognizing Drivers in Cars

There are several methods to perform facial recognition depending on the performance and complexity.

2.3 Traditional Face Recognition Algorithms.

We used **Local Binary Patterns Histogram algorithm.**

The Local Binary Patterns Histograms (LBPH) algorithm is a type of face recognition algorithm that is often used in computer vision and image processing applications. The LBPH algorithm works by analyzing the local patterns of pixels in an image of a face, and then creating a histogram of those patterns. This histogram is then used to represent the face and can be compared to other histograms to determine whether two images are of the same person. The LBPH algorithm is known for its robustness against changes in lighting and pose, and its ability to recognize faces even when they are partially obscured. It is widely used in various security systems and access controls.

Nowadays algorithms that are widely used and are implemented in OpenCV are as follows:

- Eigenfaces
- Fisher faces
- Scale Invariant Feature Transform (SIFT)
- Speed Up Robust Features (SURF)

Each method follows a different approach to extracting the image information and matching it with the input image.

Fischer-faces and Eigenfaces have almost similar approaches as well as SURF and SIFT.

These algorithms are not faster compared to modern days face-recognition algorithms. Traditional algorithms can't be trained only by taking a single picture of a person.

2.4 Deep Learning for Face Recognition.

Some of the widely used Deep Learning-based Face Recognition systems are as follows:

- Deep Face
- Deep ID series of systems
- VGG Face
- Face Net

Face recognizers generally take face images and find the important points such as the corner of the mouth, an eyebrow, eyes, nose, lips, etc. Coordinates of these points are called facial-features points, there are such 66 points.

2.5 System Interfaces

Not applicable.

2.6 User Interfaces

Includes Front-End for Student Registration and Attendance Marking.

2.7 Hardware Interfaces

- High Resolution Camera and Screen.

2.8 Software Interfaces

- Python based Computer Vision and Deep Learning libraries will be exploited for the development and experimentation of the project.
- Tools such as Anaconda Python, and PyCharm.
- Libraries such as OpenCV and Face Recognition will be utilized for this process.

3. FUNCTIONAL REQUIREMENTS DESCRIPTION

3.1 Functional Requirements List

The following list represents the functional business requirements for the PGS to cater the business requirement.

Functional Req. ID #	Functional Name	Functional Requirement Description	Functional Priority
FR 1.1	Registration	Admin will be able to register students and teachers both.	High
FR 1.2	Student Dataset	The system must have the 10-15 images of student in different directions and expressions to recognize the student properly and mark the attendance against student's respective registration number.	Medium
FR 1.3	Attendance Report	As the students are recognized by the system, report should be generated and shown to faculty.	Medium
FR 1.4	Sign-in Required	Faculty need to sign-in into the system at the time of attendance.	High
FR 1.5	Lecture's Detail	Faculty needs to add lecture detail before starting the attendance process.	High
FR 1.6	Invalid Lecture Detail	If the entered lecture details don't match with the ones in the database (excel sheet) an error dialog will be displayed.	Medium
FR 1.7	Tracking attendance	Tracking the attendance of each student to ensure students are available in each lecture.	High.
FR 1.8	Managing System	Only admin should be able to manage the system.	Medium
FR 1.9	Sending report	Sending the names of the absent students directly to the lecturer.	High
FR 2.0	Attendance Modification	Permitting the lecturer to modify the attendance.	Medium
FR 2.1	Manage Courses	Teachers will be managing the courses.	Medium

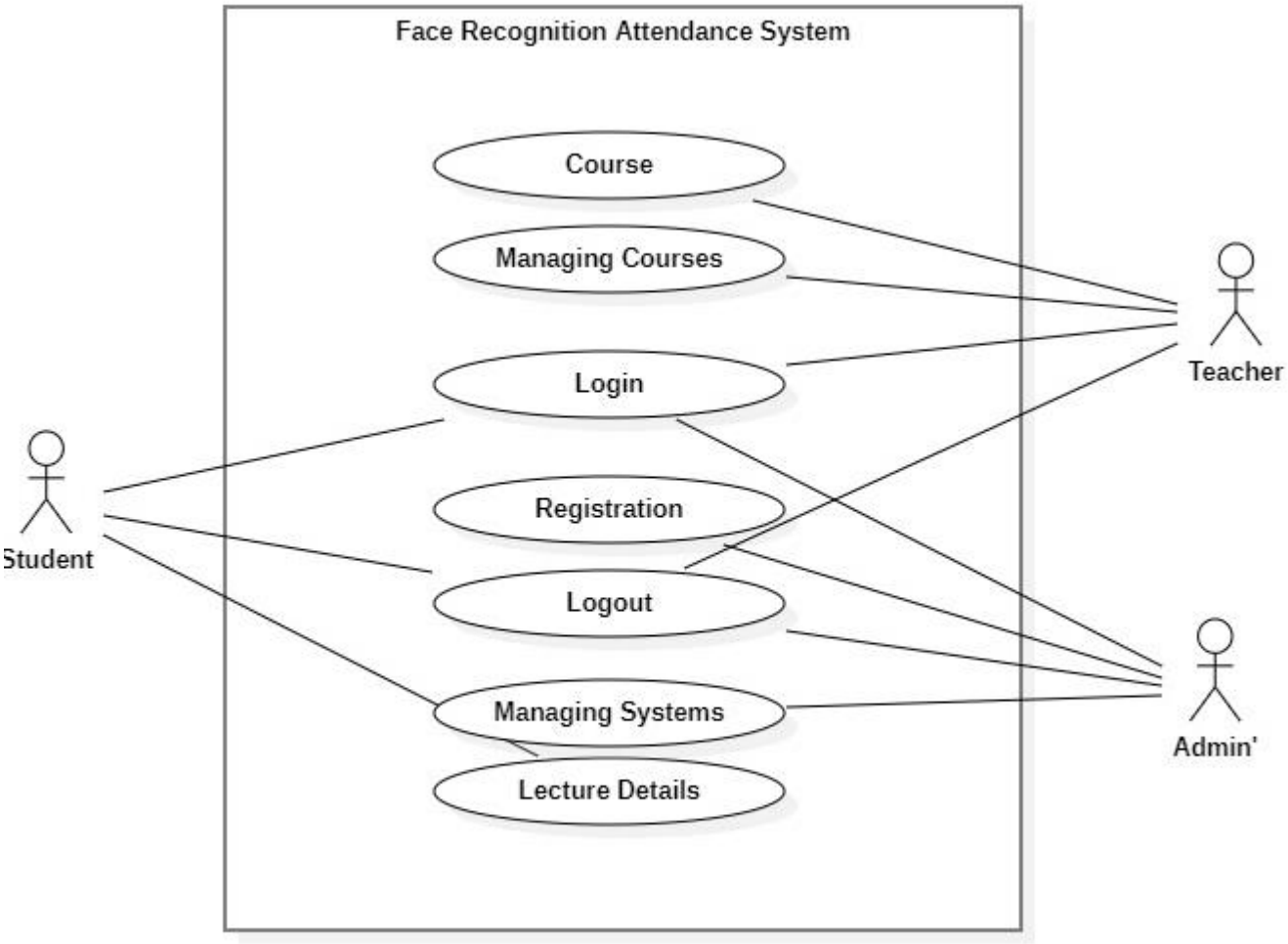
3.2 Functional Requirements List

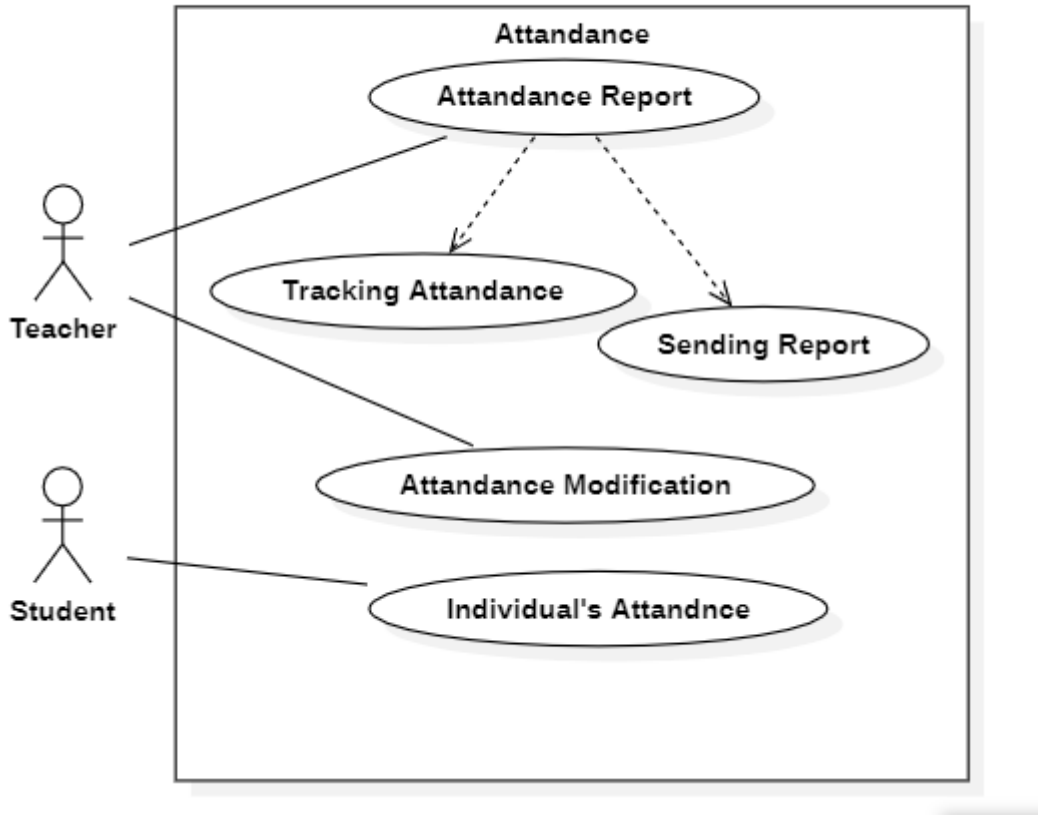
Nonfunctional Requirements are characteristics or attributes of the system that can judge its operation. The following points clarify them.

Non-Functional Req. ID #	Non-Functional Name	Non-Functional Requirement Description
NFR 1.1	Accuracy and Precision	The system should perform its process in accuracy and Precision to avoid problems.
NFR 1.2	Modifiability	the system should be easy to modify, any wrong should be correct.
NFR 1.3	Security	the system should be secure and saving student's privacy.
NFR 1.4	Usability	the system should be easy to deal with and simple to understand.
NFR 1.5	Maintainability	the maintenance group should be able to fix any problem occur suddenly.
NFR 1.6	Speed and Responsiveness	Execution of operations should be fast.

4. Use Case

4.1 Use case Diagram





4.2 Use case Description

4.2.1 Registration

Primary Actors:	• Teachers. • Students. • Admin
Pre-Conditions:	• Software installed on system. • Admin will be authorized to register Teachers and Students. • Database is accessible to Admin. • Profile info of the students is recorded.
Post-Conditions:	• Student Registered. • Teacher Registered.
Main-Scenarios:	• Student's Images, Information will be taken and stored in Database. • Teacher's Information will be taken and stored in Database.
Alternate-Flows:	• Register students if they are not registered.

4.2.2 Sign-in

Primary Actors:	• Teachers. • Students. • Admin
Pre-Conditions:	• Admin, Teachers and Students are registered. • Database is accessible to Admin. • Profile info of the students is recorded. • Real-time face detection feature is enabled.
Post-Conditions:	• Successfully signed in.
Main-Scenarios:	• System requests for user id and password • Admin will login through user id and password. • Teacher will login through user id and Password. • Student will login through user id and password. • Login details will be validated and gives access.
Alternate-Flows:	• Register Admin if not registered. • Register Teacher if not registered. • Register Student if not registered.

4.2.3 Lecture Details

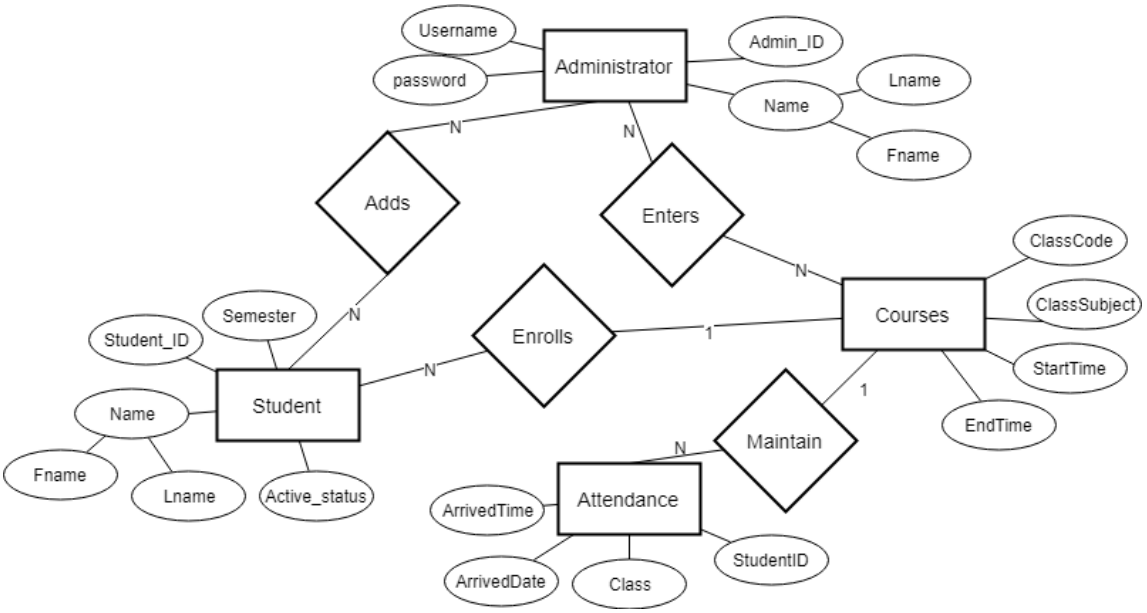
Primary Actors:	• Admin • Teachers. • Students.
Pre-Conditions:	• Course has been added to Database by Admin. • Teacher is Registered. • Teacher has the lecture details.
Post-Conditions:	• Details Successfully added.
Main-Scenarios:	• Create a Schedule. • Add course offering.
Alternate-Flows:	• Course not found. • No room free for that schedule.

4.2.4 Tracking Attendance

Primary Actors:	• Admin.
Pre-Conditions:	• Course details are already added. • Students are enrolled.
Post-Conditions:	• Details Successfully added.
Main-Scenarios:	• Create a Schedule. • Add course offering.
Alternate-Flows:	• Course not found. • No room free for that schedule.

5.Diagrams.

5.1 E-R diagram



5.2 Class Diagram