



Imam Mohammad ibn Saud Islamic University

College of Computer and Information Sciences

Information Systems Department

Automated Face Recognition Attendance System Using OpenCV Library

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Project Submitted in Fulfillment for the IS495 Course requirements.

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Date	2023/10/26
Signature	

تعهد

أتعهد بعدم المشاركة في الفعاليات أو المبادرات أو المسابقات ذات العلاقة دون أخذ موافقة خطية مسبقة من الكلية، و أقر بمعرفتي أنني إذا خالفت هذا التعهد ستم محاسبي وفق اللوائح و الأنظمة.

التوقيع



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Declaration

We **Feras Abdullah Alsayigh** and **Khalid Abdullah Algammes** being members of final year project group number **3**, declare that this report contains only work completed by members of our group except for information obtained in a legitimate way from literature, company, or university sources. All information from these other sources has been duly referenced and acknowledged in accordance with the University Policy on Plagiarism.

Furthermore, we declare that in completing the project, the individual group members had the following responsibilities and contributed in the following proportions to the final outcomes of the project:

Student ID	Responsibilities ¹	Contribution ² %	Signature
441014117	On Team Member's Responsibilities	50%	
440014544	On Team Member's Responsibilities	50%	

¹ Write down your responsibilities in the project

² Must add to 100%

Dedication

Feras Alsayigh Dedication

I want to express my deep appreciation and my sincere gratitude to my family. Especially, my parents for setting the bar high so I could try and reach it, I want to thank my father Dr. Abdullah Alsayigh for being the role model he always has been and always will be, my mother for her dedication to us and insistence on the importance of knowledge and science. One of the delights of life and encouragement is seeing the glare in our parents' eyes filled with pride looking at their children's accomplishments. During this project, we encountered an obstacle that was overcome with the help of my dear friend, Abdulaziz Allaboun. I want to thank you for explaining Laravel to us. This project stands as a testament to their dedication and serves as a token of my profound gratitude.

Khalid Algammal Dedication

I dedicate this project to my beloved family, with a special appreciation for my parents. Their unwavering support, endless encouragement, and boundless love have been the driving forces behind my academic journey. My parents' sacrifices and belief in me have been my guiding light, shaping me into the person I am today. In addition, I want to thank all the Professors and Doctors that taught me in this department. Thank you for being my constant source of inspiration and strength.

Acknowledgment

First and foremost, we would like to present our deepest gratitude to Almighty ALLAH for his bounties and blessings and for giving us the ability to finish this project.

We would like to express our deep appreciation and our sincere gratitude to our supervisor Prof. Saleh Alzahrani for his valuable advice guidance throughout this project and emphasize the importance of reading and have as much knowledge as possible to help us gain the important skills post-graduation also.

Finally, we would like to thank our families and friends for their continued encouragements and support during this project and along the years of study.

Abstract

Artificial Intelligence is often used to describe machines that mimic human behaviour. Such as learning, understanding and problem solving [1]. The project is built on a major AI subset which is Computer vision. It enables computers to learn by labeling or classifying various objects that they go over. The tool OpenCV empowers processing of pictures by applying them to mathematical operations. The Researchers aim to use this tool to recognize Students' faces. After The Researchers used Brainstorming and Questionnaire gathering techniques. They determined the problems of Manual Attendance System and noticed that it causes human errors, impersonations and time consuming which led to propose to an Automated Face Recognition Attendance System Using OpenCV Library tool. With the students entering the classroom a camera will detect their faces then recognize them and submit their attendance into a database to minimize impersonation. Afterward, the student will have the ability to check their attendance status and attendance rate in a Web-Based Application with multiple platforms to increase compatibility. An auto submission and a compatible way to check the attendance for both students and lecturers, will lead to reduce time consuming. Therefore, Imam Mohammad Ibn Saud Islamic University and other Universities are going to benefit from this project's results.

Abstract (in Arabic)

يعرف الذكاء الاصطناعي عادةً بقدرة الحاسوب التي تحاكي السلوك البشري كالتعلم والفهم وحل المشاكل. تم بناء هذا المشروع على الروية الحاسوبية وهو فرع من الذكاء الاصطناعي يمكن الكمبيوتر من التعلم بوضع علامة او تصنيف على العديد من الأجسام من خلال المسح عليها. تمكن اداة "OpenCV" من معالجة الصور بتطبيقاتها على عمليات حسابية. يهدف المشروع إلى استعمال "OpenCV" في التعرف على وجوه الطلاب لتحضير الطلاب. باستعمال تقنيات العصف الذهني والاستبيان وتوصيل الباحثين إلى العثور على مشاكل في نظام التحضير اليدوي ولاحظوا بأنه يؤدي إلى اخطاء بشرية وانتهال شخصية واستهلاك للوقت. وبهذا تم اقتراح نظام التعرف على الوجوه بشكل تلقائي بواسطة مكتبة "OpenCV". بعد دخول الطلاب لقاعة المحاضرات سيتم تحديد وجوه الطلاب بواسطة كاميرا والتعرف عليها وسيتم حفظ حضورهم في قاعدة البيانات للحد من الاحتيال وبعد ذلك سيحظى الطالب بميزة التحقق على حالة ونسبة حضوره في تطبيق الويب المدعم بمنصات متعددة. إن الرفع التلقائي للحضور ودخول التطبيق باكثر من طريقة للتحقق من الحضور سيحد من استهلاك الوقت للطلاب والمحاضرين. وبذلك سوف تستفيد جامعة الإمام محمد بن سعود الإسلامية والجامعات الأخرى من نتائج هذا المشروع.

Keywords

Web-Based Application, Face Detection, Face Recognition, Track Attendance.

List of Abbreviations

AI: Artificial Intelligence.

BPMN: Business Process Map and Notation.

OpenCV: Open-Source Computer vision.

WBS: Work Breakdown Structure.

ML: Machine Learning.

PHP: Hypertext Preprocessor.

Laravel: PHP framework.

CSS: Cascading Style Sheet.

HTML: Hypertext Markup Language.

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Chapter 1: Planning

1.1 Project Overview

We are now in Information Technology (IT) era. Therefore, today technology has occupied such an important place in the modern society. We cannot imagine life without IT. Now we use technological advancements every day; it is almost impossible to keep a track of all of them. The advent of technology has transformed human existence, altered our comprehension of the world and transformed our social interactions. Although previously met with resistance, technology is now largely accepted in our households. It is important to note that technology encompasses more than just electronics such as computers and televisions; it also includes the field of engineering science [2].

Today, technology is significantly evolved it started to expand in many fields such as Internet of Things (IoT), robotics, data analytics, data science and Artificial Intelligent (AI). AI has been defined as machine intelligence or intelligence demonstrated by machines. The term AI is often used to describe machines that mimic human behaviour. Such as learning, understanding and problem solving [1].

AI have some major subfields. One of the most applicable subset of it, is Machine Learning (ML) to the average enterprise today. ML is a mature innovation that has been around for a long time. AI that enables computers to self-learn from information and apply that learning without human intercession [3].

Another AI major subset is Computer vision which this Project will be about. It enables computers to learn by labeling or classifying various objects that they go over. The tool OpenCV empowers processing of pictures by applying them to mathematical operations. This will help with the face recognition to take students' attendance and store it to a database to mark them attend.

This Project aims to use this tool to detect human faces then recognize each student whether its blurry or its moving in order to make it accurate. Then the system will submit the students' attendance afterward. Being undergraduate students, the Researchers wanted to expand their horizons on modern fields. So, they decided to do the graduation project on "open-source computer vision" also known as "OpenCV" considering it's a new technology

and one of the most challenging tasks of Artificial Intelligence. It enables computer software to learn about the visuals in its environment. The architecture is made up of software, database and plugins that are pre-programmed with support for integrating computer vision applications [4].

For these reasons the Researchers are willing to solve a problem by this technology. So they noticed the lack of integrity of the manual approach of taking the attendance, the lack of awareness between students of how much they could skip a class until they reach the maximum rate before being forbid from the course, unorganized approach of taking the attendance between other lecturers since some starts taking the attendance at the early time of the lecture and some at the end and it takes time to do it manually. Considering what the researchers noticed they needed to fix this and learn new things as well as applying what they learned during their time at the university.

The main goal of the project is to develop a student attendance system. The system is application that utilizes machine learning technology to recognize students' faces and attend them.

To apply the system the researchers decided to go with the agile methodology. Because it's an iterative approach that serves the time limitations they have. By the end of the approach the prototype would be ready to deploy. In addition to replace the manual system with the automated system. This would make taking the attendance organized and saves time for the lecturer.

It was shown that it is accepted that the time has come to plan and implement student attendance system. Moreover, Imam university and similar organizations will take advantage of this new student attendance system.

1.2 Problem Statement

The purpose of taking the attendance is to motivate the students to get their primary source of knowledge [5]. In Saudi Arabia the students must attend the lecture for eighty percent at least of the course hours. For instance, if the hours of the course in a week is three hours

and the student was absent for more than six hours the student will be forbidden from the course. The attendance is mandatory to track due to the universities' regulations. thus, each lecturer has to take the attendance manually.

Attendance is important in the lecture, Dobkin & Marion (2010) used intervention for three large economics classes, requiring students scoring below the median mark on mid-term examination to attend classes. They found that for these students, attending classes improved performance significantly [6].

In Saudi Arabia, the responsibility of monitoring the students' attendance at each lecture is manually done by the lecturer and registered at the end of the semester. The data registered in the system includes student attendance to each subject also it includes whether the student has achieved the required attendance rate for each course. The problem of taking the attendance manually that it takes a lot of time and effort. also, the lecturer must enter all the attendance data into the university system manually [5].

The traditional method has consequences it takes time and involves the use of sheets, papers, files, or a Blackboard to mark their attendance by a cursor. This method could easily allow for impersonation and the attendance sheet could be stolen or lost. Taking attendance is time consuming and it is difficult to ascertain the number of students that have made the minimum percentage and eligible for exam. Thus, there is a need for a system that would eliminate all of these trouble spots [7].

The Researcher suggested a Face recognition automated attendance system for keeping track of the students' attendance, automatically submit it and let the students be aware of the attendance rate for each course immediately in order to motivate the students to attend and save time for the lecturer.

In fact, the manual approach of taking the attendance consume time. Therefore, it can be replaced with an automated systematic. Moreover, the main question of this project is **how to implement automated computer system in Imam university for checking students' attendance, especially with the increasing number of students every year.**

1.3 Goal and Objectives

The main goal of the project is to develop a student attendance system utilizes machine learning technology to recognize students' faces and attend them to keep track of students' attendance in a convenient way for the lecturer. This goal can be done by following the objectives below:

- To examine the current status of attendance system that are implemented in advanced countries.
- To investigate and analyze current technological infrastructure and efforts of Saudi universities towards establishing attendance system.
- To identify problems in the school of computer and information science regarding such issues.
- Develop a web-based application system for student's attendance based on machine learning techniques to manage courses Students and Lecturers.
- Test the proposed system in real life to advantage of this new student attendance system.

1.4 Project Impact

Let us talk about the project impact by explaining what would happen if the prototype got implemented locally at Imam Mohammad Ibn Saud Islamic University. The students will be more motivated to come to the class since they can check their attendance anytime in the web-based system. They are going to come early since the attendance is going to be taken at the early time of the lecture because the system follows a time frame schedule. The lecturer wouldn't have to keep track and submit the students' attendances in the system since it's going to be automatically submitted by the system.

According to [5], The higher education system in Sri Lanka has a similar approach to the Saudi Arabia approach of taking the attendance. So, they could adopt the system in their universities and any other university can. Either locally or globally.

1.5 Project Stakeholders

In order to meet this project goal, The Researchers have Three Stakeholders as follow:

1. Department (Administrator):

Is a stakeholder who has the full access and controls of the system.

2. Lecturer:

An end-user that has only the permissions of checking the attendance of their assigned sections and modify it.

3. Student:

An end-user with the permissions of read only to check their attendance and see their attendance rate.

1.6 Approach

According to the Project aim The Researchers found that agile is a suitable development methodology for the planned web-based system. To improve the web-based system as fast as possible and make it with the given time schedule by the department. Also, give the Researchers the flexibility to change it over time in a better way to satisfy to the changes.

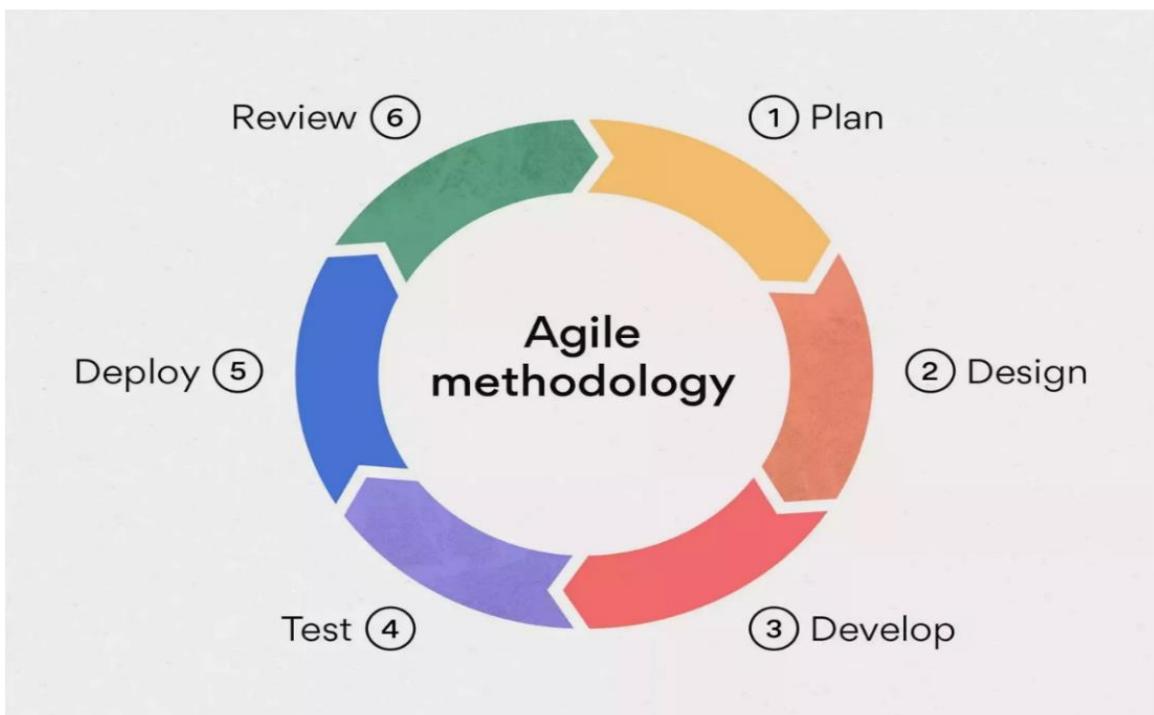


Figure 1 Agile Methodology

1. Plan:

in this phase the researchers must plan and identify the requirements with the stakeholders.

2. Design:

During this phase the Researchers will design a prototype. This phase is iterated to ensure the design meets the requirements.

3. Developing:

In this phase the Researchers will develop the software features according to the requirements. Sprint planning meetings help the team to break down the requirements into manageable tasks.

4. Testing:

At the end of each sprint the team will conduct testing on the features developed during the sprint.

5. Deployment:

In this phase the system is reviewed by the stakeholders to ensure that all requirements and objectives are satisfied.

6. Review:

After each sprint the team gathers feedback and makes the necessary changes.

1.7 Project Scope

Systems must have boundaries and limitations to determine the project aim and what could serve and cannot, to satisfy the needs of stakeholders. This project meant to create a Web application to take the students attendance using a computer vision approach in a classroom.

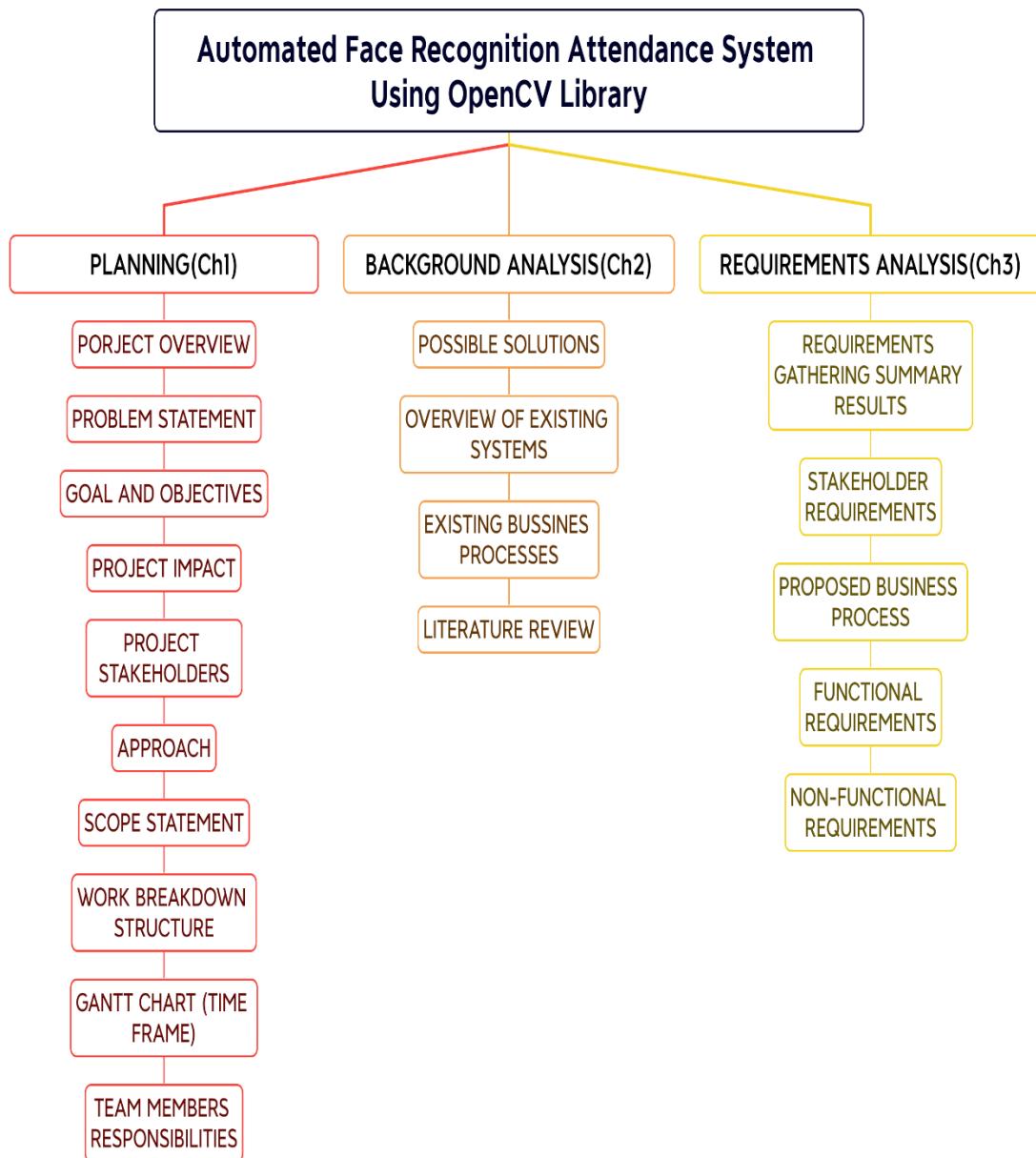
- Boundaries:**

The product aims to serve any Academic Facility. It would be deployed to mobile as well as computer. It would show the students their attendance rate at their courses, the lecturer could modify it. The administrator would have the full authorization of the Application.

- Limitation:**

It wouldn't be able to take the lecturer attendance. Students do not modify their attendance only check their attendance.

1.8 Work Breakdown Structure



Presented with xmind

Figure 2 WBS

1.9 Gantt Chart (Time Frame)

		Task Name	Duration	Start	Finish
1		1 Face recognition automated attendance	56 days	Sun 3/19/23	Thu 6/1/23
2		1.1 Initiation	5 days	Sun 3/19/23	Thu 3/23/23
3		1.1.1 Project idea	2 days	Sun 3/19/23	Mon 3/20/23
4		1.1.2 Proposal form "Initial"	2 days	Tue 3/21/23	Wed 3/22/23
5		1.1.3 First meeting form + Proposal form "Final"	1 day	Thu 3/23/23	Thu 3/23/23
6		1.2 CHAPTER 1: PLANNING	10 days	Sat 3/25/23	Thu 4/6/23
7		1.2.1 PROJECT OVERVIEW	1 day	Sat 3/25/23	Sat 3/25/23
8		1.2.2 PROBLEM STATEMENT	1 day	Sun 3/26/23	Sun 3/26/23
9		1.2.3 PROJECT IMPACT	1 day	Mon 3/27/23	Mon 3/27/23
10		1.2.4 PROJECT STAKEHOLDERS	1 day	Tue 3/28/23	Tue 3/28/23
11		1.2.5 OBJECTIVES	1 day	Wed 3/29/23	Wed 3/29/23
12		1.2.6 APPROACH	1 day	Thu 3/30/23	Thu 3/30/23
13		1.2.7 SCOPE STATEMENT	2 days	Fri 3/31/23	Sun 4/2/23
14		1.2.8 WORK BREAKDOWN STRUCTURE	1 day	Mon 4/3/23	Mon 4/3/23
15		1.2.9 GANTT CHART (TIME FRAME)	1 day	Tue 4/4/23	Tue 4/4/23
16		1.2.10 TEAM MEMBERS RESPONSIBILITIES	2 days	Wed 4/5/23	Thu 4/6/23
17		1.3 CHAPTER 2: BACKGROUND ANALYSIS	11 days	Tue 4/18/23	Tue 5/2/23
18		1.3.1 POSSIBLE SOLUTIONS	3 days	Tue 4/18/23	Thu 4/20/23
19		1.3.2 OVERVIEW OF EXISTING SYSTEMS	4 days	Fri 4/21/23	Wed 4/26/23
20		1.3.3 EXISTING BUSINESS PROCESSES	4 days	Wed 4/26/23	Sat 4/29/23
21		1.3.4 LITERATURE REVIEW [IF APPLICABLE]	3 days	Sun 4/30/23	Tue 5/2/23
22		1.4 CHAPTER 3: REQUIREMENTS ANALYSIS	9 days	Wed 5/3/23	Mon 5/15/23
23		1.4.1 REQUIREMENTS GATHERING SUMMARY RESULTS	2 days	Wed 5/3/23	Thu 5/4/23
24		1.4.2 STOCKHOLDER REQUIREMENTS	2 days	Fri 5/5/23	Sat 5/6/23
25		1.4.3 PROPOSED BUSINESS PROCESS	3 days	Sun 5/7/23	Tue 5/9/23
26		1.4.4 FUNCTIONAL REQUIREMENTS	3 days	Wed 5/10/23	Fri 5/12/23
27		1.4.5 NON-FUNCTIONAL REQUIREMENTS	2 days	Sat 5/13/23	Mon 5/15/23
28		1.5 FINAL PROJECT SUBMISSION	3 days	Tue 5/30/23	Thu 6/1/23

Figure 3 Gantt Chart

1.10 Team Member's Responsibilities

	Task Name	Duration	Resource Names
1	1 Face recognition automated attendance	56 days	All Member
2	1.1 Initiation	5 days	All Member
3	1.1.1 Project idea	2 days	All Member
4	1.1.2 Proposal form "Initial"	2 days	All Member
5	1.1.3 First meeting form + Proposal form "Final"	1 day	All Member
6	1.2 CHAPTER 1: PLANNING	10 days	All Member
7	1.2.1 PROJECT OVERVIEW	1 day	All Member
8	1.2.2 PROBLEM STATEMENT	1 day	Feras Alsayigh
9	1.2.3 PROJECT IMPACT	1 day	Khalid Algammes
10	1.2.4 PROJECT STAKEHOLDERS	1 day	Khalid Algammes
11	1.2.5 OBJECTIVES	1 day	All Member
12	1.2.6 APPROACH	1 day	All Member
13	1.2.7 SCOPE STATEMENT	2 days	Feras Alsayigh
14	1.2.8 WORK BREAKDOWN STRUCTURE	1 day	Feras Alsayigh
15	1.2.9 GANTT CHART (TIME FRAME)	1 day	Khalid Algammes
16	1.2.10 TEAM MEMBERS RESPONSIBILITIES	2 days	All Member
17	1.3 CHAPTER 2: BACKGROUND ANALYSIS	11 days	All Member
18	1.3.1 POSSIBLE SOLUTIONS	3 days	All Member
19	1.3.2 OVERVIEW OF EXISTING SYSTEMS	4 days	All Member
20	1.3.3 EXISTING BUSINESS PROCESSES	4 days	All Member
21	1.3.4 LITERATURE REVIEW [IF APPLICABLE]	3 days	All Member
22	1.4 CHAPTER 3: REQUIREMENTS ANALYSIS	9 days	All Member
23	1.4.1 REQUIREMENTS GATHERING SUMMARY RESULTS	2 days	All Member
24	1.4.2 STOCKHOLDER REQUIREMENTS	2 days	All Member
25	1.4.3 PROPOSED BUSINESS PROCESS	3 days	Feras Alsayigh
26	1.4.4 FUNCTIONAL REQUIREMENTS	3 days	Khalid Algammes
27	1.4.5 NON-FUNCTIONAL REQUIREMENTS	2 days	Feras Alsayigh
28	1.5 FINAL PROJECT SUBMISSION	3 days	Feras Alsayigh

Figure 4 Team Member's Responsibilities

Chapter 2: Background Analysis

2.1 Possible Solutions

Having discussed the problem in section 1.2 we propose the Radio Frequency Identification (RFID) and Fingerprint Recognition as possible solutions.

2.1.1 RFID

RFID is a wireless system comprised of two components: tags and readers. It could be deployed as a method of attendance with each student having a tag with their Student's Information decoded in it. Once the student enters the classroom, he scans it with a reader assuming that it already has been implemented inside the classroom then it marks his attendance.

2.1.2 Fingerprint Recognition

The Fingerprint Recognition System could also be an alternative solution, so each student enters the classroom scan his fingerprint through a fingerprint scanner assuming that it has been implemented in the classroom. Then it marks their attendance.

2.1.3 Pros and cons of the proposed alternative solutions

Starting with the pros, the RFID and the Fingerprint Recognition methods both could discriminate each student individually either by the Tag or the Fingerprint. Two more advantages to the Fingerprint Recognition System that it could not be impersonate and it only needs Fingerprint Scanner as a hardware aside from computers and software development. The RFID needs a Tag and a Reader making it two additional hardware equipment which is not particularly a disadvantage but just pointing the obvious.

Coming down to the cons The Researchers decided to break it down into Four criteria Time consuming, Impersonation, Stolen or lost and Physical interaction or the need of human interference during the process of taking the attendance only not the implementation.

Clarifying all the categories starting with the time consuming, both solutions might make a queue of students either to scan the tag or the fingerprint which leads to extend the time of the process. Moreover, clarifying the difference between impersonation and stolen or

lost criteria. The impersonate means that a student pretend to be another student which in this case it can't be done with the Fingerprint Recognition System, but it could happen with the RFID System if someone stole, or the student give the tag to another student voluntarily to mark his attendance. The difference is if it stolen or lost the process of bringing a new tag for the student might increase the cost and time for the attendance process in addition to marking the student as absent until the time he receives a new tag. Lastly during the process of marking the attendance both systems need the student to mark their own attendance by scanning.

2.1.4 Cost-Benefit Analysis of Proposed solutions

2.1.4.1 RFID Cost

According to [8], “Active readers are typically purchased as part of a complete system, with tags and mapping software to determine the tags location. Most UHF readers cost from \$500 to \$2,000, depending on the features in the device.”. Making the median if we subtract the minimum from the maximum to get the range and divided it by two then adding the minimum after it to get the median $((2000-500)/2) + 500 = \$1,250$ then make an assumption that at least one collage has 30 classrooms we multiply the number by 30 which make it \$37,500.

2.1.4.2 Fingerprint Scanner Cost

According to [9], “A USB fingerprint scanner that plugs directly into a USB port of a desktop computer/laptop can retail from \$19 to as much as \$100.”. Doing the same equation in RFID Cost $((100-19)/2) + 19 = 59.5$ with the same assumption we multiply the number by 30 making it \$1785 making it much lower cost than RFID.

2.1.4.3 Face Recognition Cost

The additional hardware is a web camera which according to [10] the price range of a webcam costs about \$30-\$240 doing the same equation and assumption above $((240-30)/2) + 30 * 30 = \3150 in total making it the mid cost between the alternative solutions.

Solutions	RFID	Fingerprint Recognition	Face Recognition
Benefits			
Time Consuming	Yes	Yes	No
Impersonation	Yes	No	No
Stole or Lost	Yes	No	No
Physical Interaction	Yes	Yes	No
Cost			
Equipment cost	High	Very Low	Low

Table 1 Cost-Benefit

2.1.5 The Chosen Possible Solution

After Choosing the main criteria and conducting the cost-benefit analysis Table 1 above. The Researchers came to conclude that the best possible solution is Face Recognition. it doesn't have the best cost, but it is the best solution.

2.2 Overview of Existing systems

Since the project aims to focus on developing an attendance system. The Researchers chose the Systems mentioned below. For the purpose of overviewing the Existing Systems.

2.2.1 Schoolpass

Schoolpass is a system for taken attendance by check in to each class period themselves using a QR code, barcode, or RFID tag [11].

- **Advantage**

1. Save teachers' time.
2. Students can track their attendance.

- **Disadvantage**

1. Need for human interaction.
2. Scanning physical card or digital ID not the students themselves.
3. Students can attend each other which cause impersonation.
4. Not used by universities.
5. Students must access to the internet.

2.2.2 Manual Attendance

Manual attendance refers to the process of taking the attendance by physically marking Students' names either on papers or Blackboard.

- **Advantage**

1. It serves the purpose.

- **Disadvantage**

1. Need for human interaction.
2. Students can attend each other which cause impersonation.
3. Takes much more time than any other alternative system.

The proposed system needs to have the advantages of both systems which are serves the purpose, saving Lecturer time in addition to the ability for the student to keep track of his attendance. Also, avoid all the disadvantages which are mainly focused on extracting human interaction to make the process fully automated for the purpose of time consuming. And eliminate impersonation.

2.3 Existing Business Processes

Al-Imam Mohammad Bin Saud University Currently use The Manual Attendance System. Which is taking by the lecturer at his lecture by calling each Student name individually. For more details, The Researchers explained it in the BPMN As-Is Figure (5).

2.3.1 BPMN As-Is

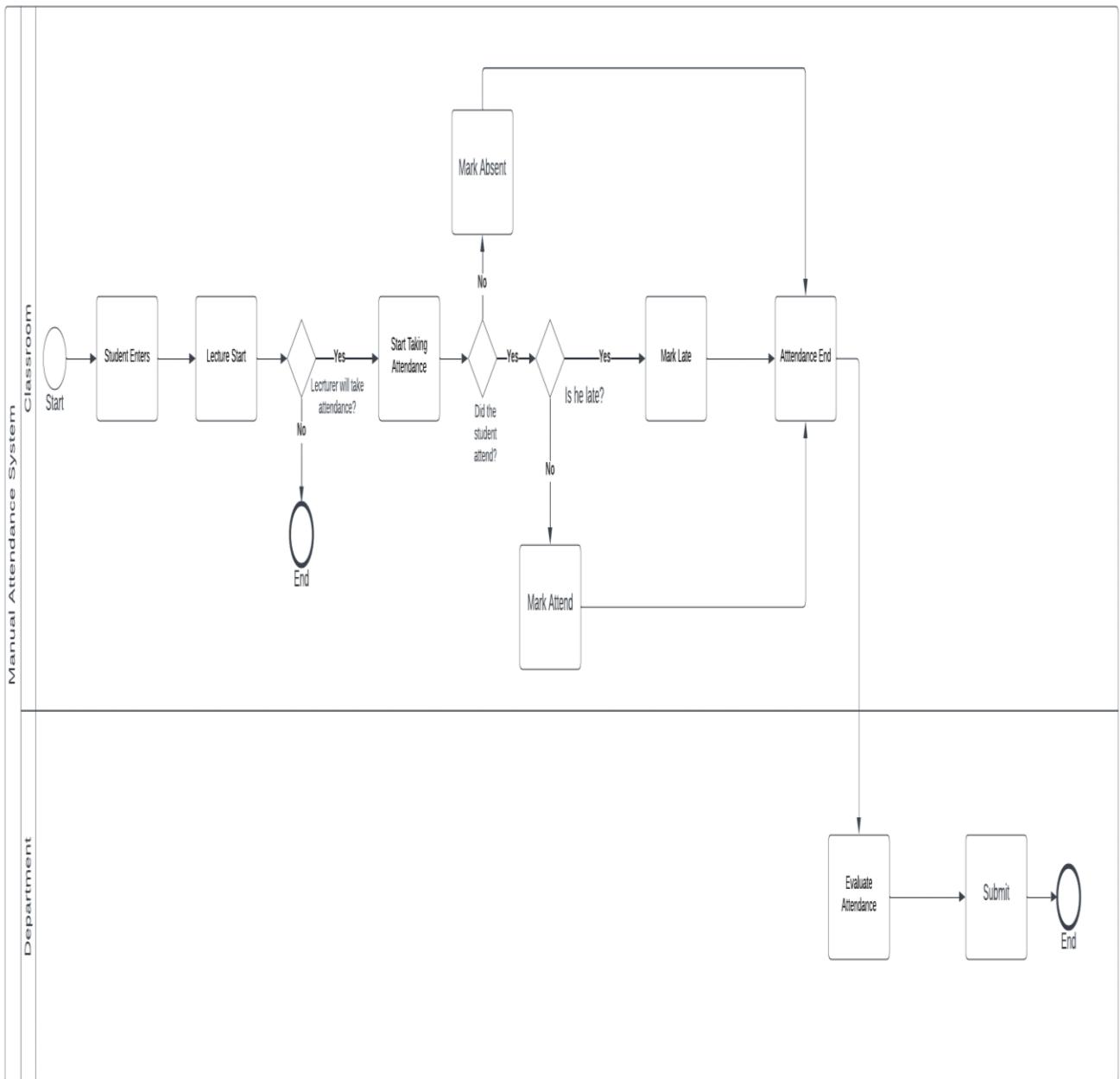


Figure 5 BPMN(As-Is)

Chapter 3: Requirements Analysis

3.1 Requirement Gathering Summary Results

To gather required information through short amount of time the Researchers decided to choose questionnaire and brainstorming Techniques (see Appendix). To collect the functional and non-functional requirements.

3.1.1 Questionnaire and Surveys Technique

Questionnaire and Surveys is a gathering technique that is desirable to obtain input from large number of people. A Questionnaire, also called a Survey is a document containing several standard questions that can be sent to many individuals. [12]

The Researchers conducted an online Google Form survey that been published via social media platforms in order to gather requirements reaching (249) Students taking the survey. Setting up these questions below.

1. Has the lecturer ever taken attendance after the actual time of the lecture?
2. Do you prefer to see your attendance rate in each course via an app or website?
3. Have you ever witnessed an impersonation of attendance?
4. Does the attendance process take some of your own time or the lecture itself?
5. Have you ever been marked absent even though you were present?
6. Have you ever been forbidden from a course without your knowledge?

The questions were conducted in binary form of answer (Yes or No) to identify the requirements and the possibility of impersonation, Time consuming and human mistakes of The Manual Attendance System.

3.1.1.1 Questionnaire Summary Results

After requirement gathering in questionnaire. The Researchers found out that 85.5% of the students said that they have witnessed lecturers taking the attendance after the actual time of the lecture which led to take time from both the lecturer and students. Moreover, 47% have witnessed impersonation of attendance taking. Which indicate the need of a requirement that saves time which is the face Detection and recognition with instant submission. And 96.8% wanted to check their attendance status on an app or website.

3.1.2 Brainstorming Technique

Brainstorming is another popular technique of obtaining input, which refers to a small group discussion of a specific problem, opportunity, or issue. This technique encourages new ideas, allows team participation, and enables participants to build on each other's inputs and thoughts. [12]

The Researcher used this method to increase team participation and build up inputs to gather as much thoughts as possible considering both functional and non-functional requirements.

3.1.2.1 Brainstorming Summary Results

The Researchers subdivided the most critical categories related to non-functional requirements using Brainstorming technique which are Reduce Time consuming, Minimize impersonation and Usability.

3.2 Stakeholder Requirements

After gathering all information needed from surveys and brainstorming techniques. The proposed System must fulfill the stakeholders' requirements. Each stakeholder must be able to execute these requirements. The stakeholders have been mentioned in section 1.3 which are administrator, students and lecturer that will be defined individually with more details in this section.

3.2.1 Administrator Stakeholder

Administrator or department is a stakeholder whose responsibility is to have whole accessibility to the System. In addition to initiate the system by submitting Schedules, Sections and Students

3.2.1.1 Administrator Stakeholder Requirements

- The Administrator should have the ability to submit Schedules, Sections and Students to the database.
- The Administrator should have the authority to modify Schedules, Section and Students that have already been submitted to the database.
- The Administrator should have the accessibility to monitor and track all sections.
- The Administrator should have the accessibility of monitoring and tracking all Students' attendance.
- The Administrator should have the authority to modify all student attendance.

3.2.2 Students Stakeholder

Students are the most important stakeholder since the whole project is based on taking their attendance. Which is a stakeholder that the system takes his attendance and have only the accessibility to monitor their own attendance status and check his attendance rate.

3.2.2.1 Students Stakeholder Requirements

- Students should have their attendance taken once they enter the classroom.
- Students should have access to their sections to monitor each section's attendance individually.
- Students should be able to see their attendance rate in each section they enrolled in.

3.2.3 Lecturer Stakeholder

A lecturer stakeholder has certain sections assigned to his name with students assigned to these sections. He has permission to monitor his assigned sections students only and modify their attendance.

3.2.3.1 Lecturer Stakeholder Requirements

- A Lecturer should have the access to the assigned sections to monitor students' attendance.

- A Lecturer should be able to modify the students' attendance in his assigned sections only.

3.3 Proposed Business Process

The proposed business process as shown in Figure (6) allows the student to check his attendance as well as be taking without human interaction. Starting with opening the Web-based System Application then enrolling an image of his face. Afterward, he attends the class then his face gets detected and recognized to be submitted to the database. Ending it with the option to check his attendance status.

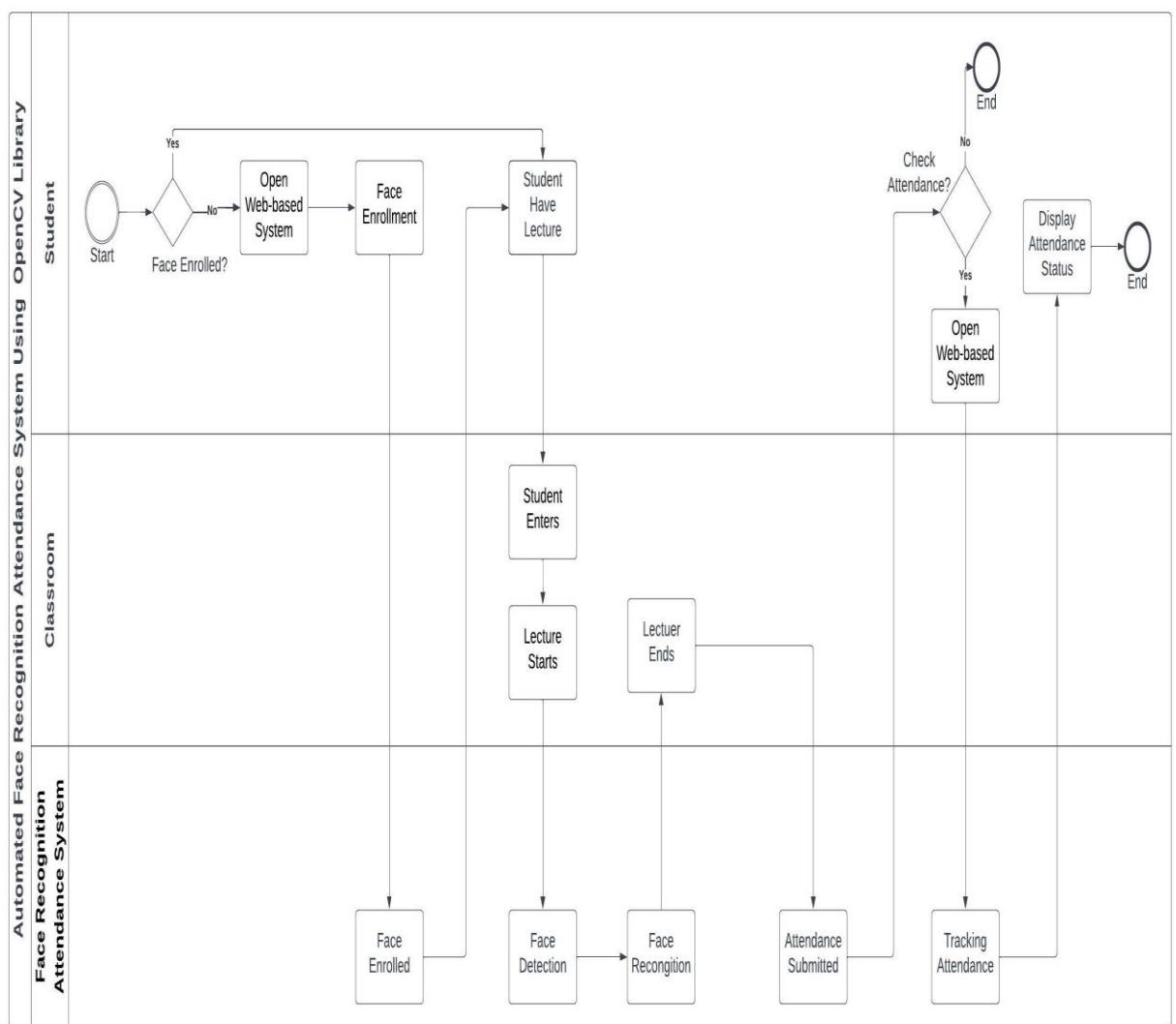


Figure 6 BPMN(To-Be)

3.4 Functional Requirements

The Researchers conduct the major functionality in multiple systems “Face Recognition Attendance System” for taking the attendance and store it into a database and “Track Attendance Application” to monitor the attendance status which would be explain in a Use-case Diagram and explained furthermore in Use-case Description.

3.4.1 Use-case Diagrams

3.4.1.1 Face Recognition Attendance System Use-case Diagram

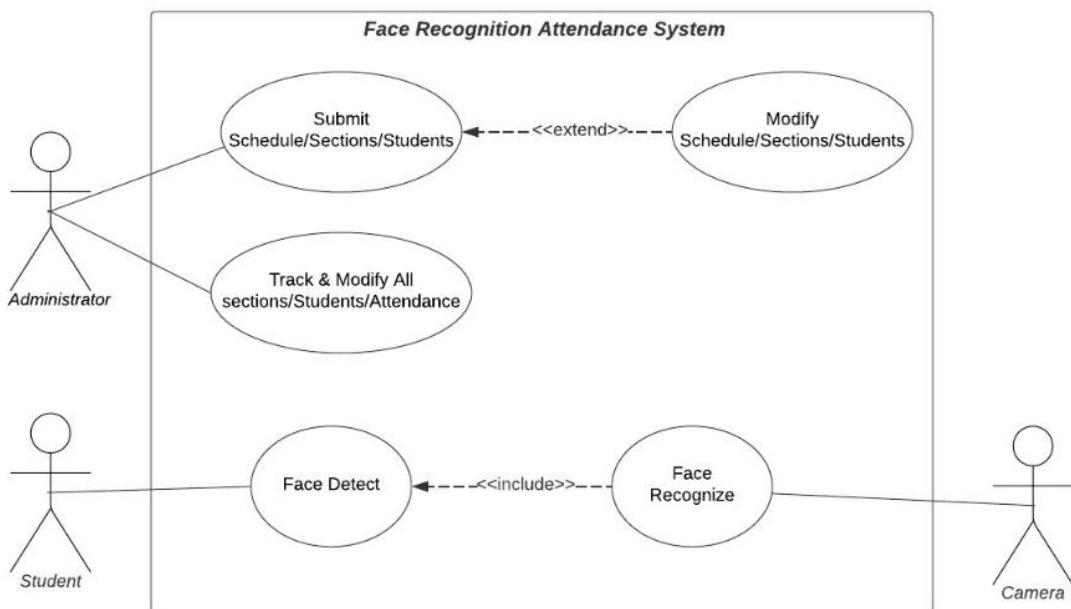


Figure 7 Face Recognition Attendance System Use-case Diagram

3.4.1.2 Track Attendance Application Use-case Diagram

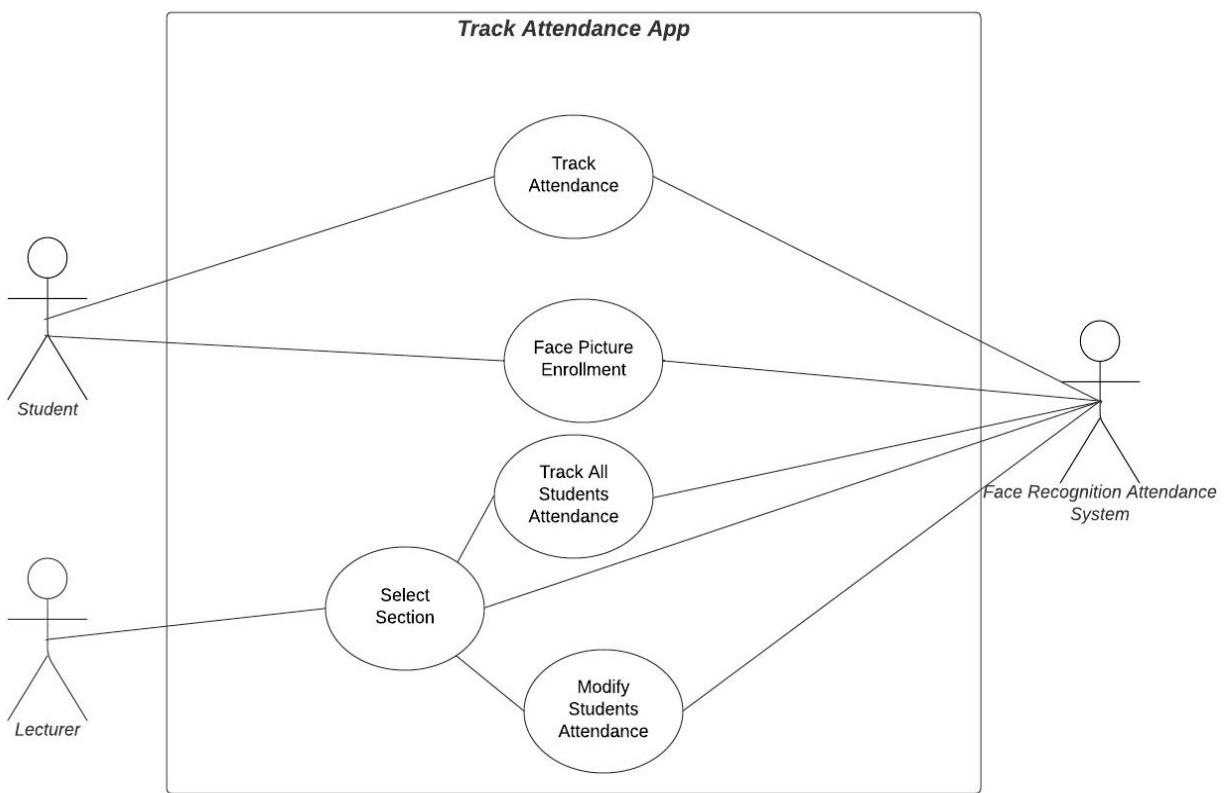


Figure 8 Track Attendance Application Use-case Diagram

3.4.2 Use-case Description

3.4.2.1 Face Recognition Attendance System Use-case Description

Use Case Name: Submit Schedule/Sections/Students	Use Case ID: 1
Primary Actor: Administrator	Secondary Actor: None
Use Case Description: Administrator (Department) schedule and submit the students in each section at the beginning of the semester.	
Preconditions: <ul style="list-style-type: none">• Students must register in the subject.	
Postconditions:	
Main Flow: <ol style="list-style-type: none">1-Administrator schedule the sections with students that are registered.2-Administrator determine classroom for each section.3- Administrator assign students in the appropriate section.	

Table 2 Face Recognition Attendance System Use-case Description Use Case ID 1

Use Case Name: Modify Schedule/Sections/Students	Use Case ID: 2
Primary Actor: Administrator	Secondary Actor:
Use Case Description: in this case the Administrator can modify after submitting the Schedule/Sections/Students	
Preconditions:	
<ul style="list-style-type: none"> • Submit Schedule/Sections/Students 	
Postconditions:	
Main Flow:	
<ol style="list-style-type: none"> 1- Modify schedule. 2- Modify sections. 3- Modify students. 	

Table 3 Face Recognition Attendance System Use-case Description Use Case ID 2

Use Case Name: Track & Modify Sections/Students/Attendance	Use Case ID: 3
Primary Actor: Administrator	Secondary Actor:
Use Case Description: Administrator can monitor and modifying students' attendance in all the sections	
Preconditions:	
<ul style="list-style-type: none"> • Must submit students' schedule. • Students must be in a section. 	
Postconditions:	
Main Flow <ol style="list-style-type: none"> 1- Administrators open the sections. 2- Administrators select the desired section. 3- Administrators monitor all student attendance. 4- Administrators modify all students' attendance in all sections. 	

Table 4 Face Recognition Attendance System Use-case Description Use Case ID 3

Use Case Name: Face Detect	Use Case ID: 4
Primary Actor: Student	Secondary Actor: Camera
Use Case Description: in this case the system detects students' faces who enters the classroom through the camera.	
Preconditions: <ul style="list-style-type: none"> • The Camera must be in working condition. • The Camera must be connected to the system database. • The Camera should have a clear view. • A Student enters the classroom 	
Postconditions: <ul style="list-style-type: none"> • Face Recognize. 	
Main Flow: <ol style="list-style-type: none"> 1- Camera is ready to detect who enters the classroom. 	

Table 5 Face Recognition Attendance System Use-case Description Use Case ID 4

Use Case Name: Face Recognize	Use Case ID: 5
Primary Actor:	Secondary Actor: Camera
Use Case Description: in this case the camera ready to recognize the student that the camera detected.	
Preconditions: <ul style="list-style-type: none"> • Camera must work. • Camera must connect with the system database. • Student face must be enrolled. • Face must be detected. 	
Postconditions:	
Main Flow: <ol style="list-style-type: none"> 1- Enrol Student' face in the web-based system. 2- Students enter the classroom. 3- The Camera detects the student face. 4- The Camera recognizes the student face. 	

Table 6 Face Recognition Attendance System Use-case Description Use Case ID 5

3.4.2.2 Track Attendance Application Use-case Description

Use Case Name: Track attendance	Use Case ID: TA1
Primary Actor: Student	Secondary Actor: Face Recognition Attendance System
Use Case Description: student track his attendance from a device by selecting the subject and the attendance status will appear.	
Preconditions: <ul style="list-style-type: none">• Student must be logged in to his account.	
Postconditions:	
Main Flow: Assuming the student is registered in the section. <ol style="list-style-type: none">1- student login to his account.2- select the section.3- attendance status display.	

Table 7 Track Attendance Application Use-case Description ID TA1

Use Case Name: Face picture Enrollment.	Use Case ID: TA2
Primary Actor: Student.	Secondary Actor: Face Recognition Attendance System.
Use Case Description: in this case student must enrol his face image to the database to use it for recognition.	
Preconditions:	
<ul style="list-style-type: none"> • Student must be logged in to his account. • Face Picture should be clear. 	
Postconditions:	
Main Flow:	
<ol style="list-style-type: none"> 1- Student log in. 2- Students enrol the picture. 3- Store the picture in the database. 	

Table 8 Track Attendance Application Use-case Description ID TA2

Use Case Name: Select Section	Use Case ID: TA3
Primary Actor: Lecturer	Secondary Actor: Face Recognition Attendance System
Use Case Description: in this case the lecturer select section after selecting the section he can track and modify the attendance.	
Preconditions:	
<ul style="list-style-type: none"> • Login to his own account 	
Postconditions:	
Main Flow:	
<ol style="list-style-type: none"> 1- Open the web-based application. 2- Log in to his account as lecturer. 3- Select section. 	

Table 9 Track Attendance Application Use-case Description ID TA3

Use Case Name: Track All students Attendance	Use Case ID: TA4
Primary Actor: Lecturer	Secondary Actor: Face Recognition Attendance System
Use Case Description: in this case lecturer is linked with our system to track student attendance.	
Preconditions:	
<ul style="list-style-type: none"> • Must login as lecturer and select the section that he wants to track its students attendance. 	
Postconditions:	
Main Flow:	
<ol style="list-style-type: none"> 1- Open the web-based Application. 2- Login to his account as a lecturer. 3- Select section. 4- track students' attendance. 	

Table 10 Track Attendance Application Use-case Description ID TA4

Use Case Name: Modify Students Attendance	Use Case ID: TA5
Primary Actor: Lecturer	Secondary Actor: Face Recognition Attendance System
Use Case Description: lecturer after select section all the student in this section will appear with their attendance and the lecturer can modify.	
Preconditions:	
<ul style="list-style-type: none"> • Select section 	
Postconditions:	
Main Flow:	
<ol style="list-style-type: none"> 1- Open the Web-based Application. 2- Login to his account as a lecturer. 3- Select section. 4- Modify students' attendance. 	

Table 11 Track Attendance Application Use-case Description ID TA5

3.5 Non-functional Requirements

After conducting the Requirements Gathering Techniques. The Researchers been led to divide the main non-functional requirements criteria into three categories which are Reduce Time consuming, Minimize impersonation and Usability.

3.5.1 Reduce Time consuming

- There must be no physical interaction during the process of taking the attendance to reduce the time.
- Students will be able to see their attendance without talking to the lecturer which reduce time.
- The attendance submission should be after the lecture for the student to see them directly which reduce time.

- The lecturer should not have to collect and submit the attendance to reduce time.

3.5.2 Usability

- Making the web-based application easy to use for the stakeholders with clear words and buttons to make them increase in usability and learnability.
- Making the web-based application multiplatform to for ease of access and increase compatibility.

3.5.3 Minimize impersonation

- Make the process of taking the attendance fully automated with face recognition camera to minimize impersonation.

Chapter 4: System Design

4.1 System Modelling

4.1.1 Activity diagrams

This Activity Diagram describes the Administrator role and all its accessibilities.

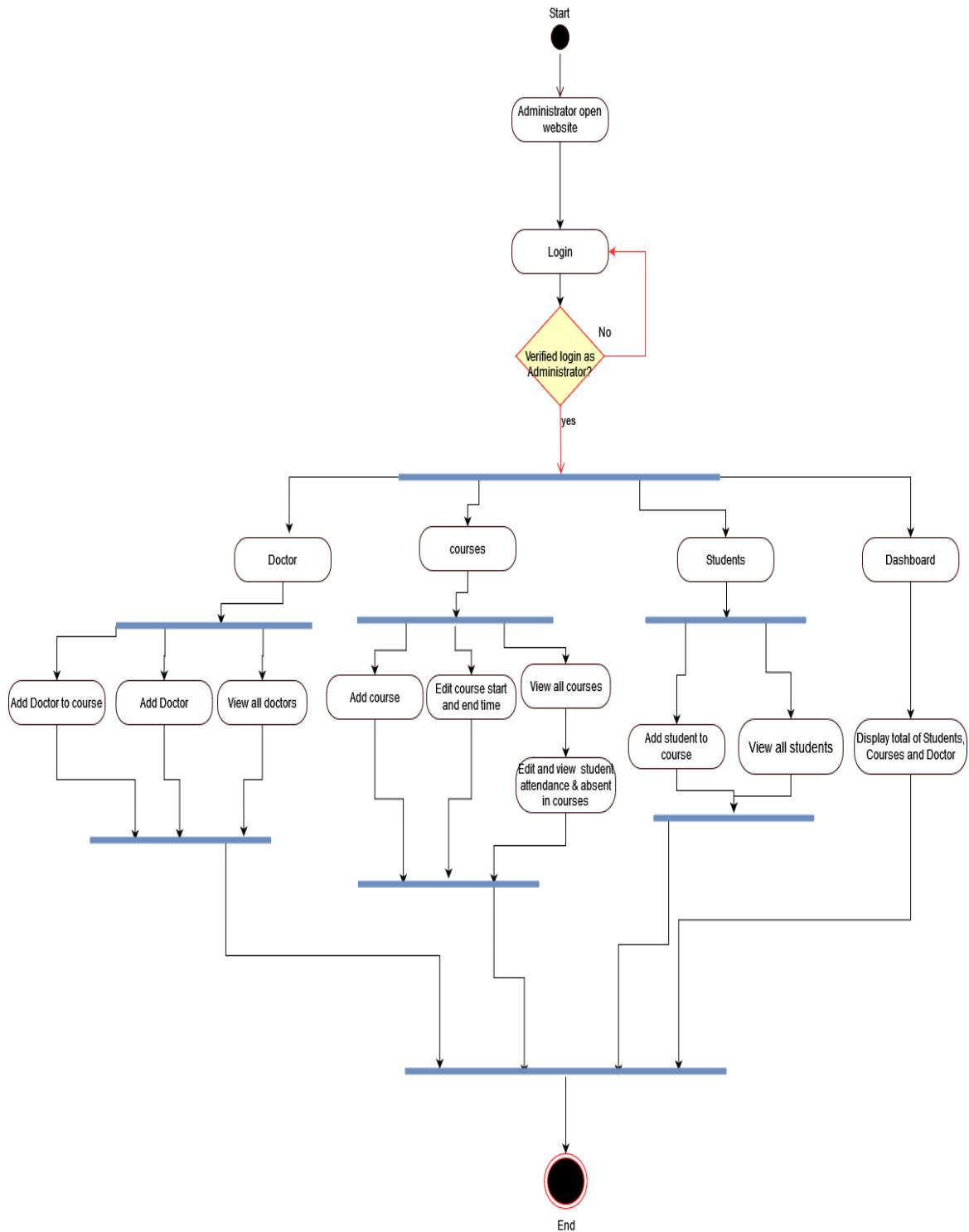


Figure 9 Administrator Role Activity Diagram

This Activity Diagram describes the Doctor role and all its accessibilities.

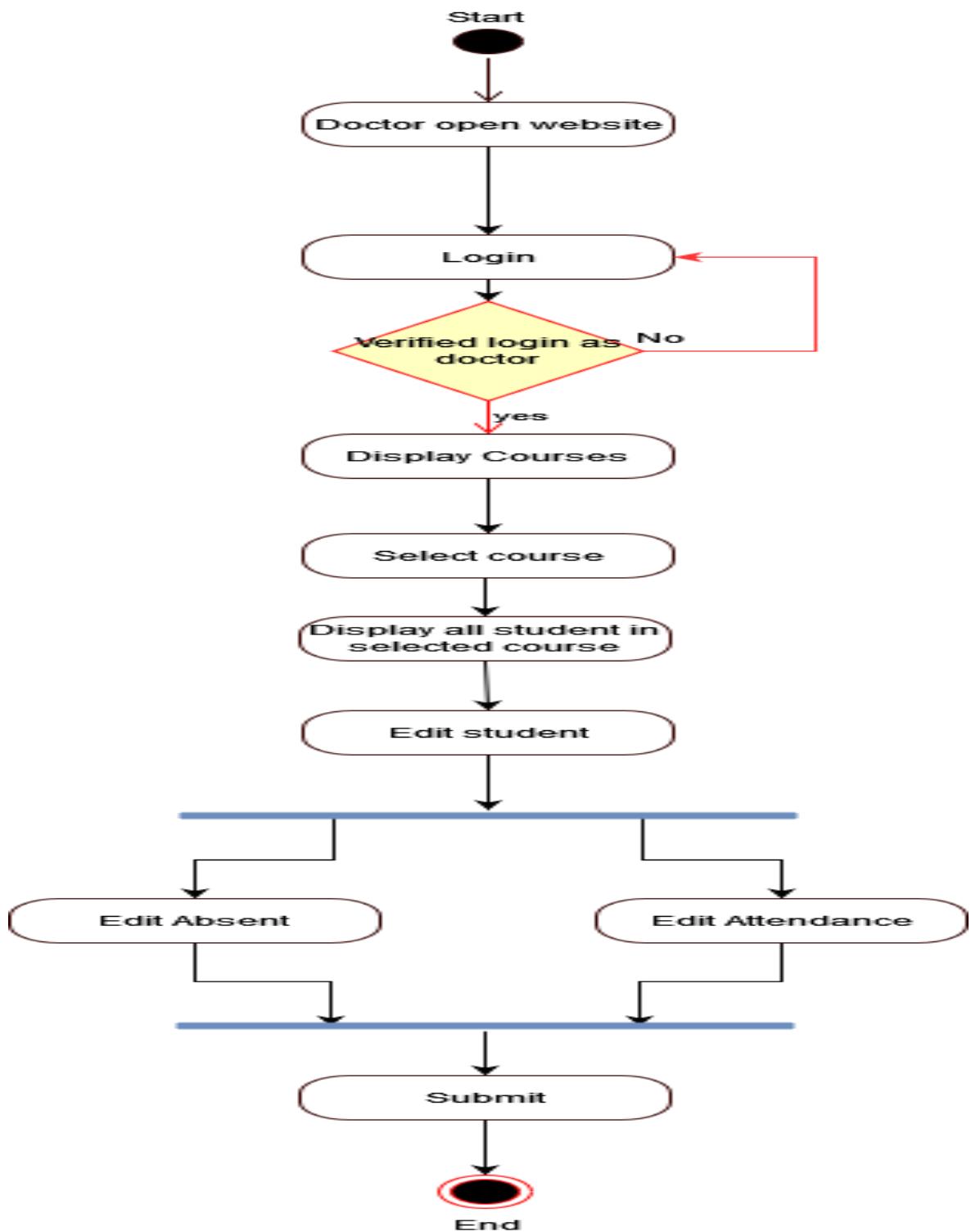


Figure 10 Doctor Role Activity Diagram

This Activity Diagram describes the Student role and all its accessibilities.

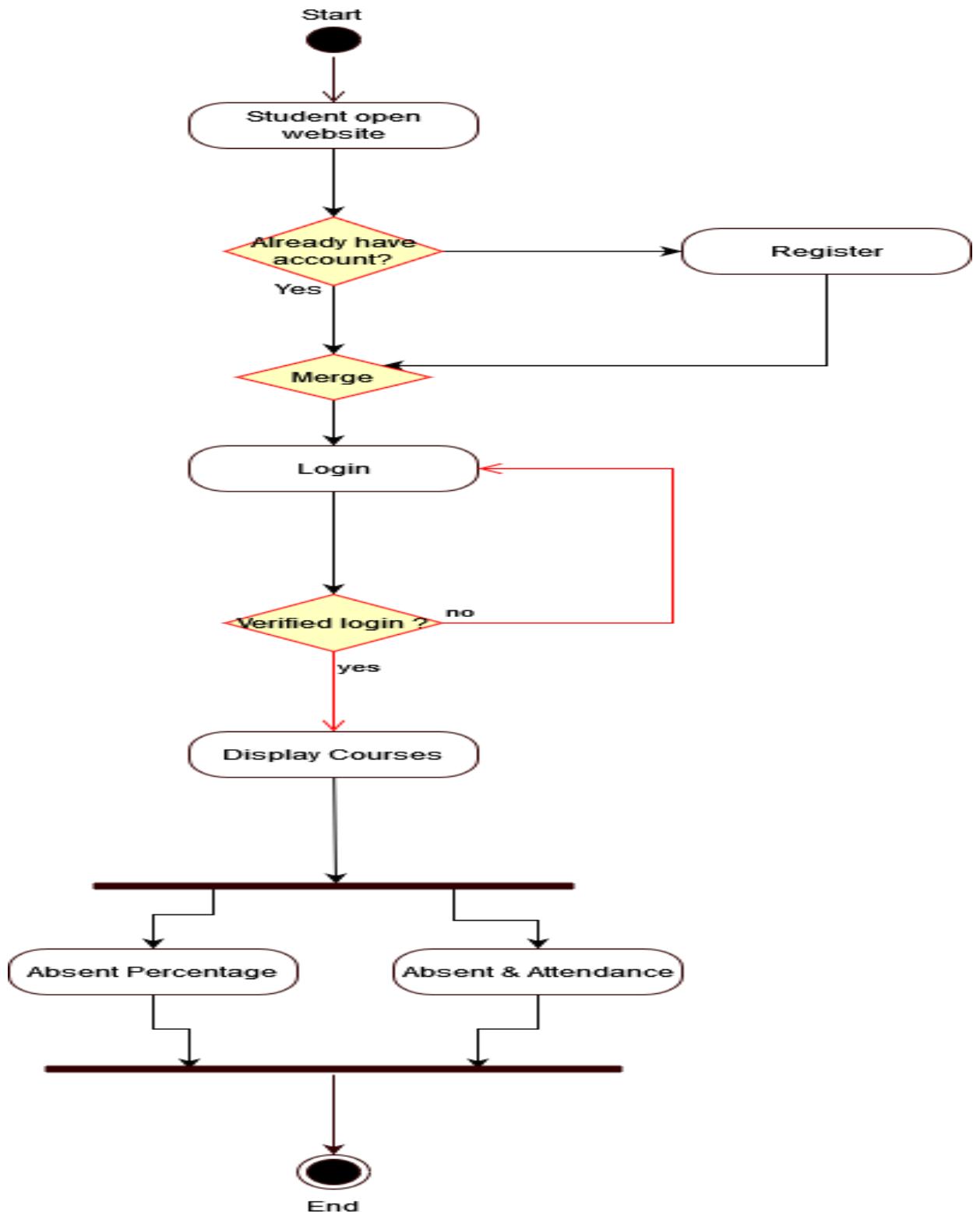


Figure 11 Student Role Activity Diagram

4.1.2 Class Diagram

A class Diagram for the Website

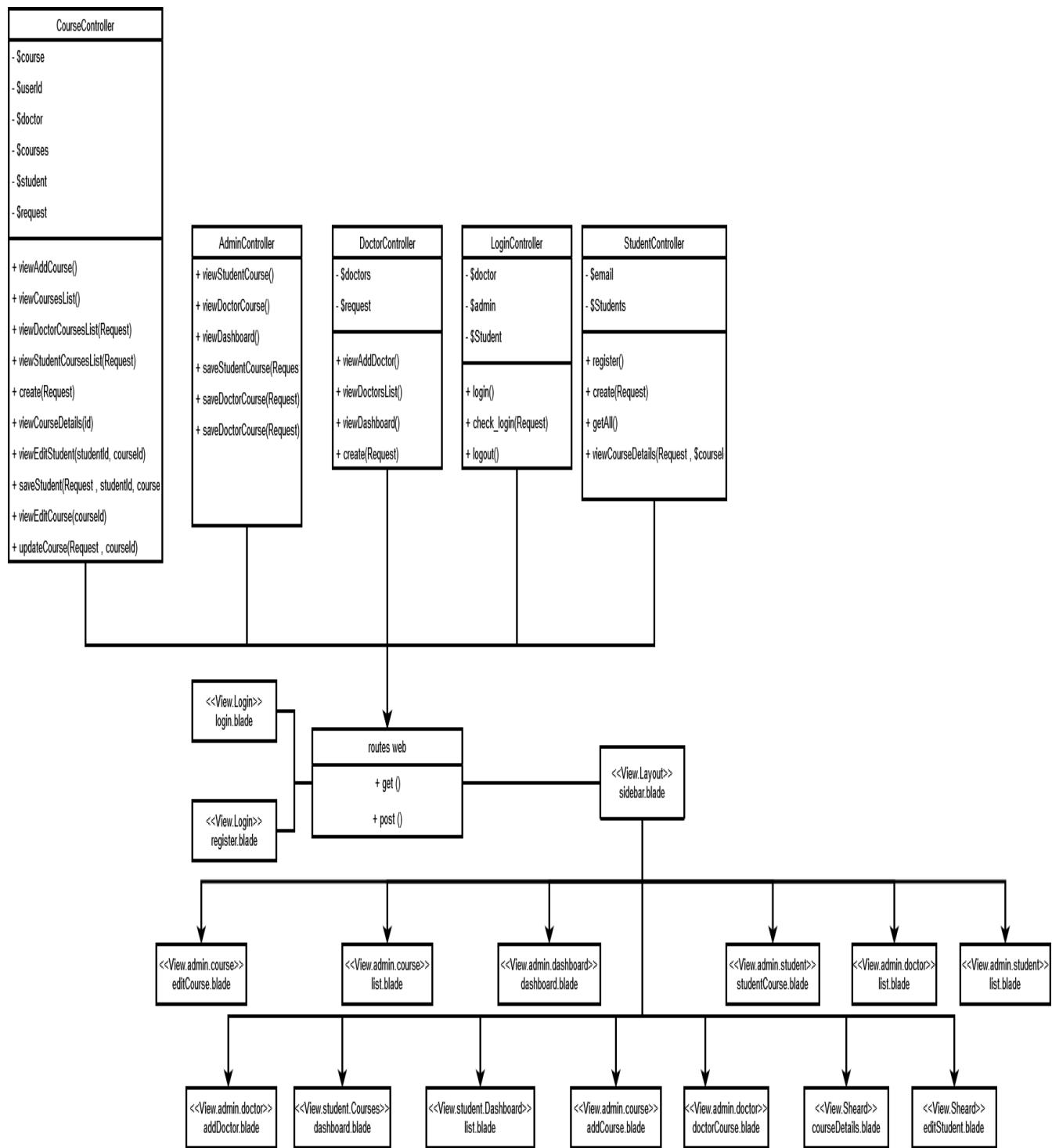


Figure 12 Class Diagram

4.1.3 Sequence Diagrams

This Sequence Diagram demonstrates the series actions of the Administrator role.

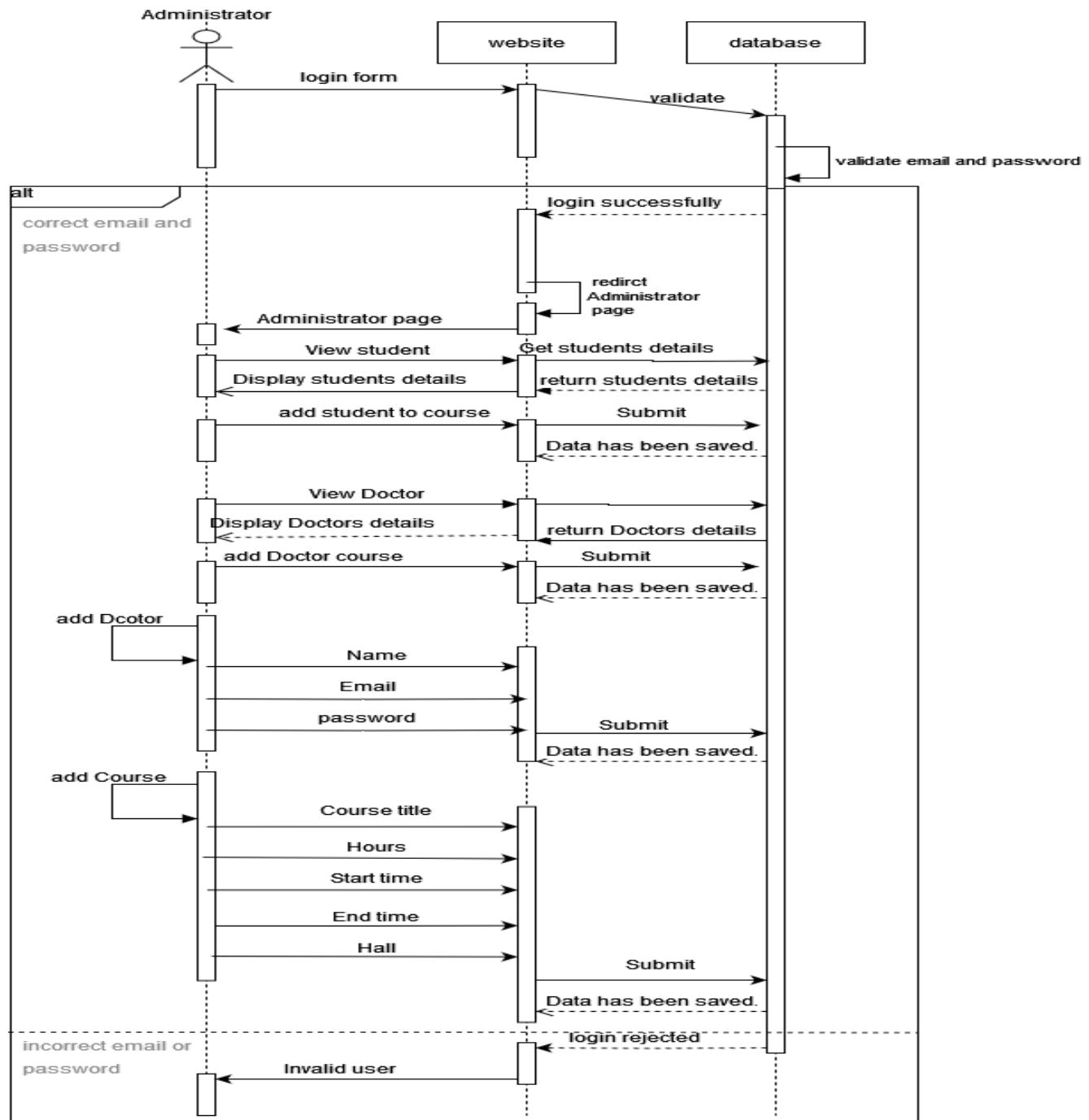


Figure 13 Administrator Sequence Diagram

These Sequence Diagrams demonstrate the series actions of the Student role.

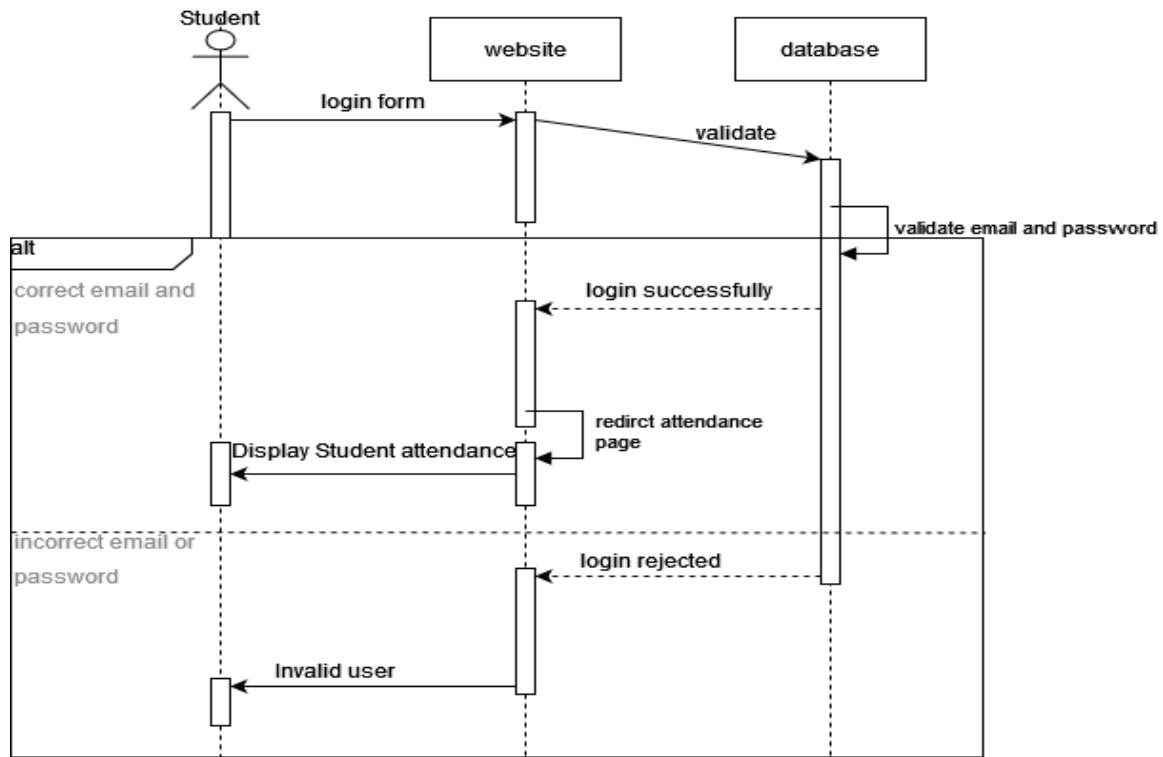


Figure 14 Student Sequence Diagram

The series actions of the Student role on the Attendance Process.

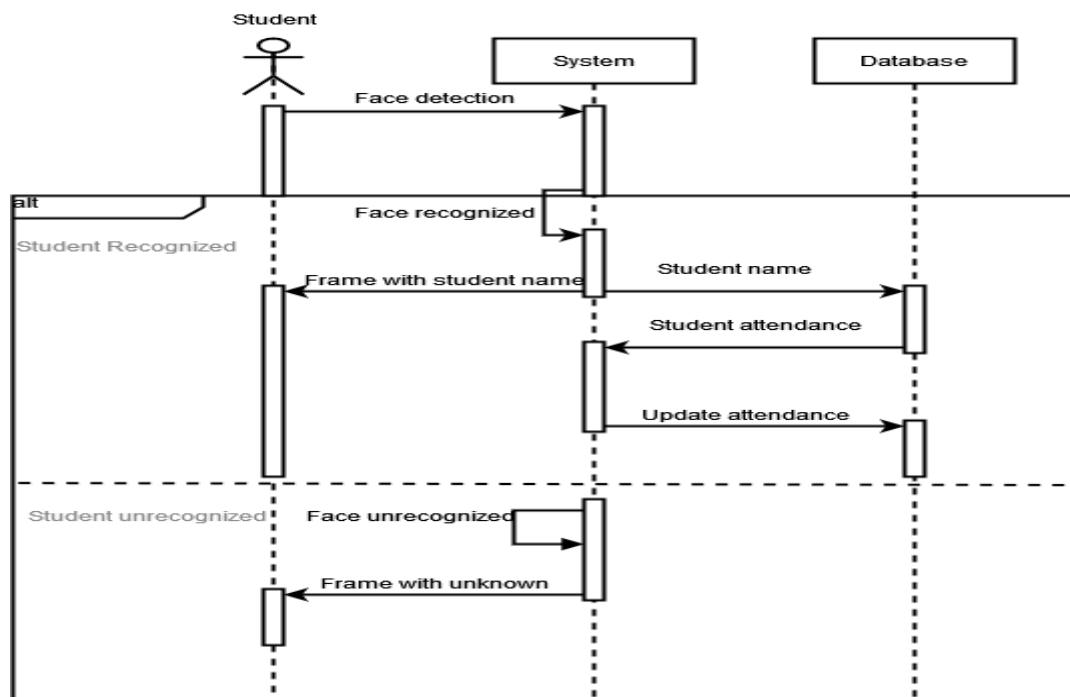


Figure 15 Attendance Process Sequence Diagram

4.2 Data Modelling

4.2.1 ER Diagram

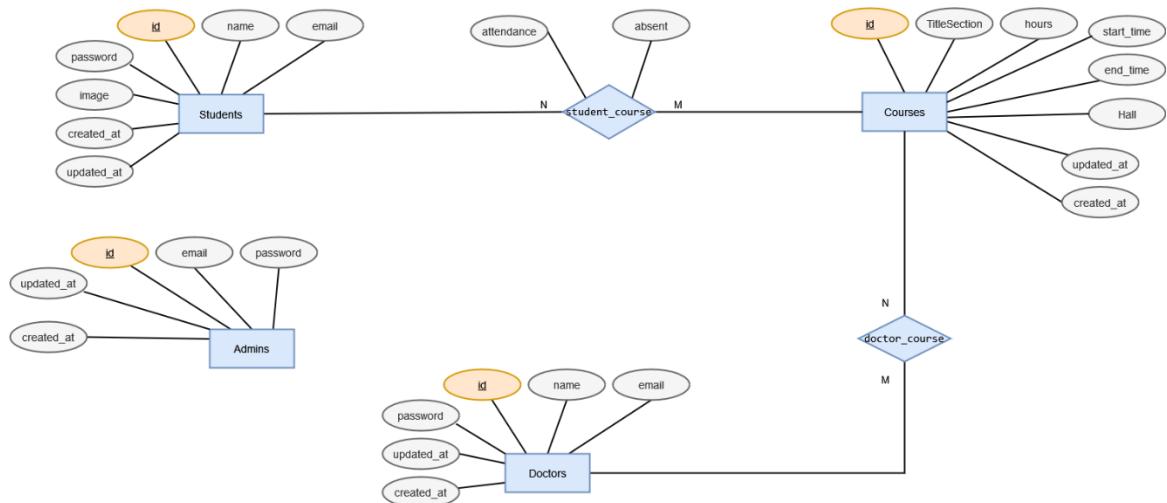


Figure 16 ER Diagram

4.2.2 Data Dictionary

Table: Students			
Column name	Type	Size	Notice
Id	Integer	20	Primary key
Name	Varchar	255	
Email	Varchar	255	Unique
Password	Varchar	255	
Image	Longblob		
Created_at	Timestamp		
Updated_at	Timestamp		

Table 12 Students Table Dictionary

Table: Courses			
Column name	Type	Size	Notice
Id	Integer	20	Primary key
TitleSection	Varchar	255	Unique
Hours	Integer	11	
Hall	Varchar	11	
Start_time	Time		
End_time	Time		
Created_at	Timestamp		
Updated_at	Timestamp		

Table 13 Courses Table Dictionary

Table: admin			
Column name	Type	Size	Notice
Id	Integer	20	Primary key
Email	Varchar	255	Unique
Password	Varchar	255	
Created_at	Timestamp		
Updated_at	Timestamp		

Table 14 admin Table Dictionary

Table: Doctor_course

Column name	Type	Size	Notice
Id	Integer	20	Primary key
Doctor_id	Integer	20	Foreign key
Course_id	Integer	20	Foreign key
Created_at	Timestamp		
Updated_at	Timestamp		

Table 15 Doctor_course Table Dictionary

Table: Student_Course

Column name	Type	Size	Notice
Id	Integer	20	Primary key
Student_id	Integer	20	Foreign key
Course_id	Integer	20	Foreign key
Absent	Integer	11	
attendance	Integer	11	
Created_at	Timestamp		
Updated_at	Timestamp		

Table 16 Student_Course Table Dictionary

4.3 Detailed Interface Design

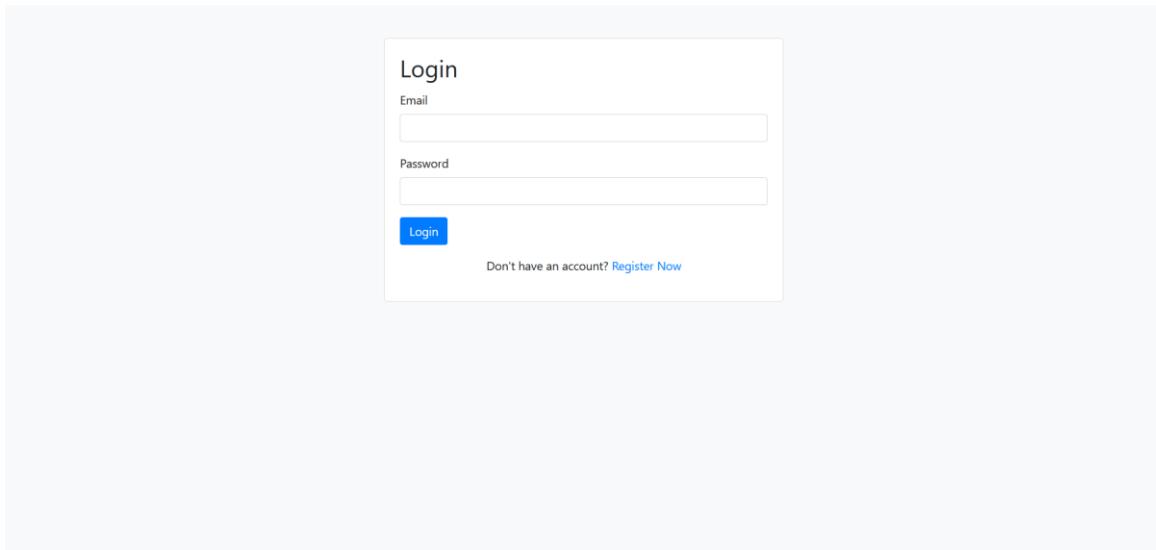


Figure 17 Login page

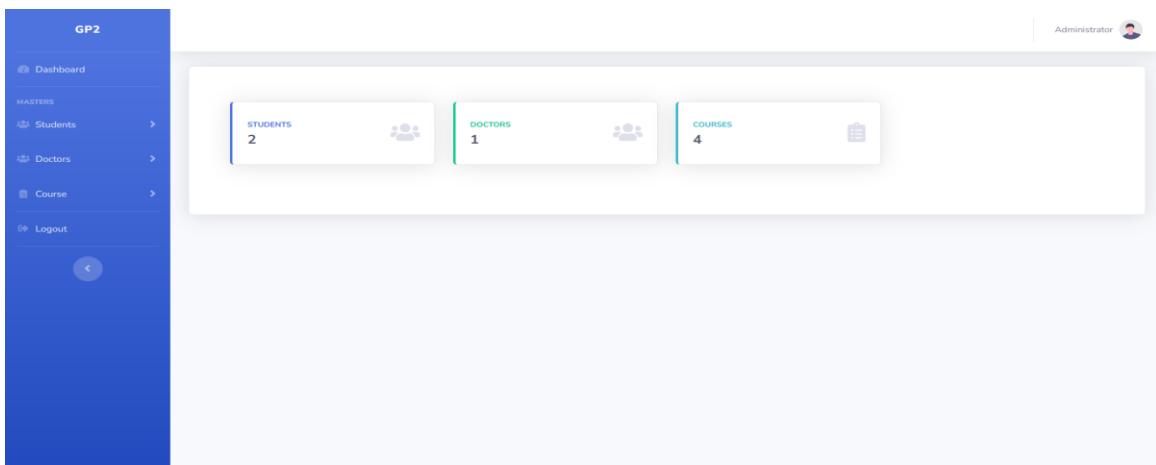


Figure 18 Administrator Dashboard

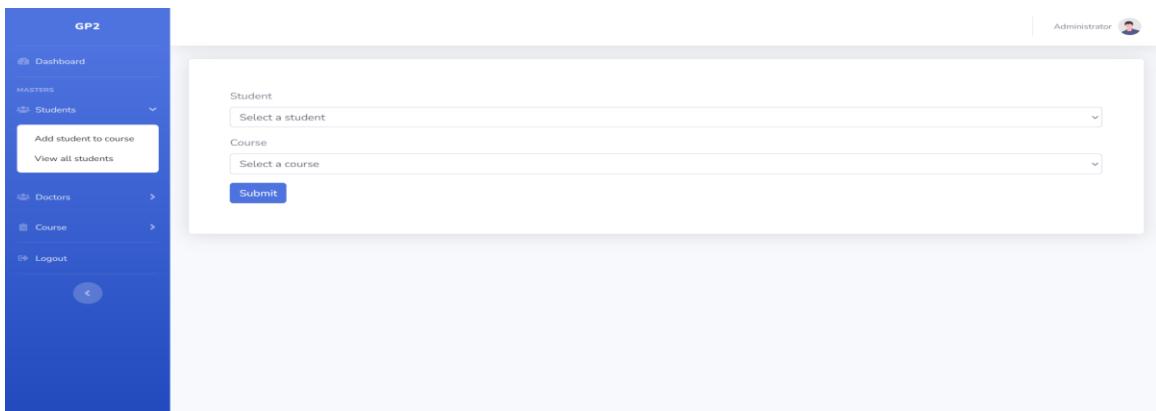


Figure 19 Adding Student to Course

#	Name	Email
1	Feras Alsayigh	ferasalsayigh@gmail.com
2	khalid algammas	hh@gmail.com

Figure 20 View all students

Name

Email

Password

Figure 21 Adding Doctors

Doctor

Course

Figure 22 Assigning Doctor to Course

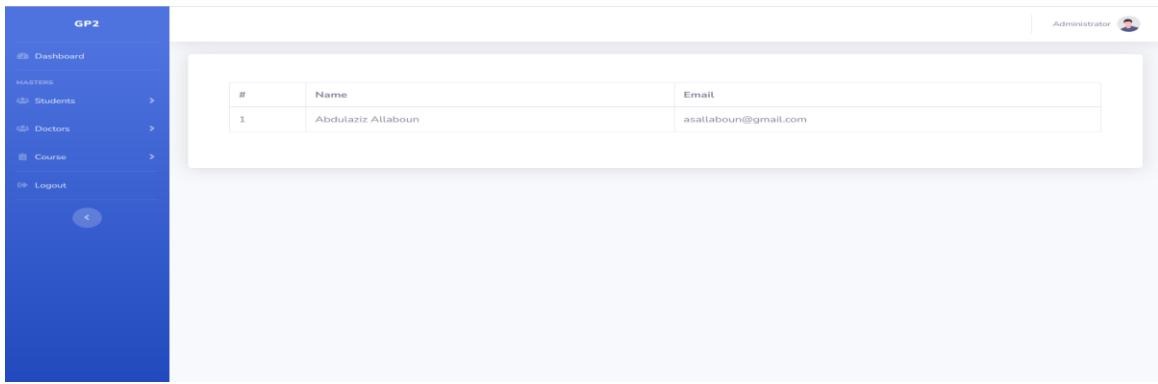


Figure 23 View Doctors

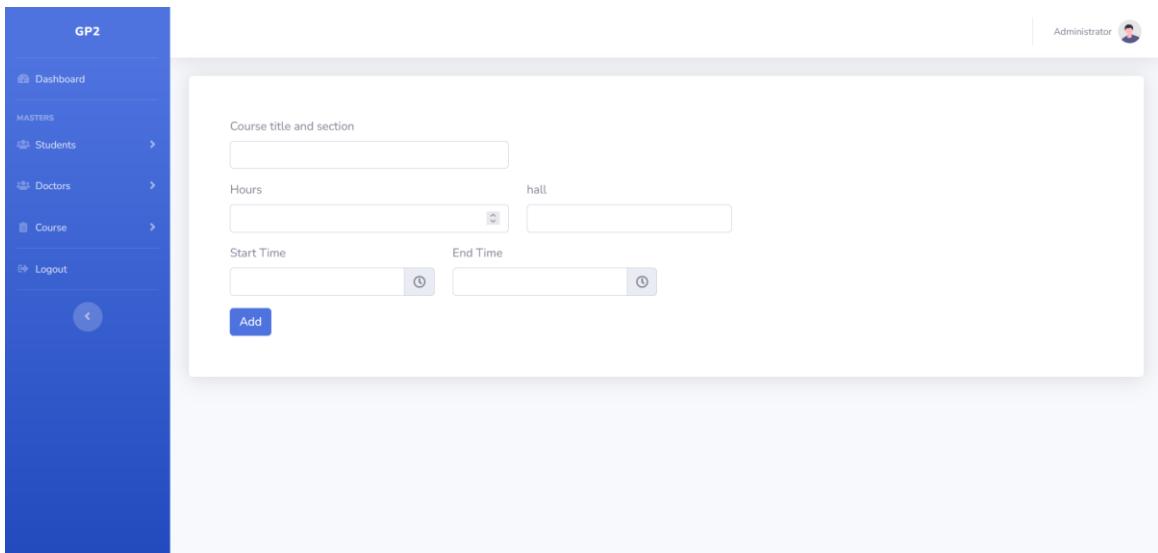


Figure 24 Add Course

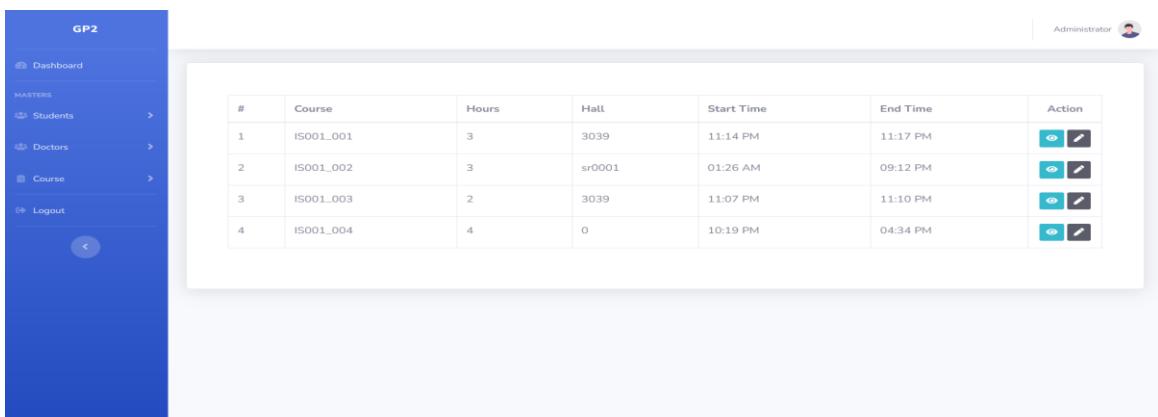
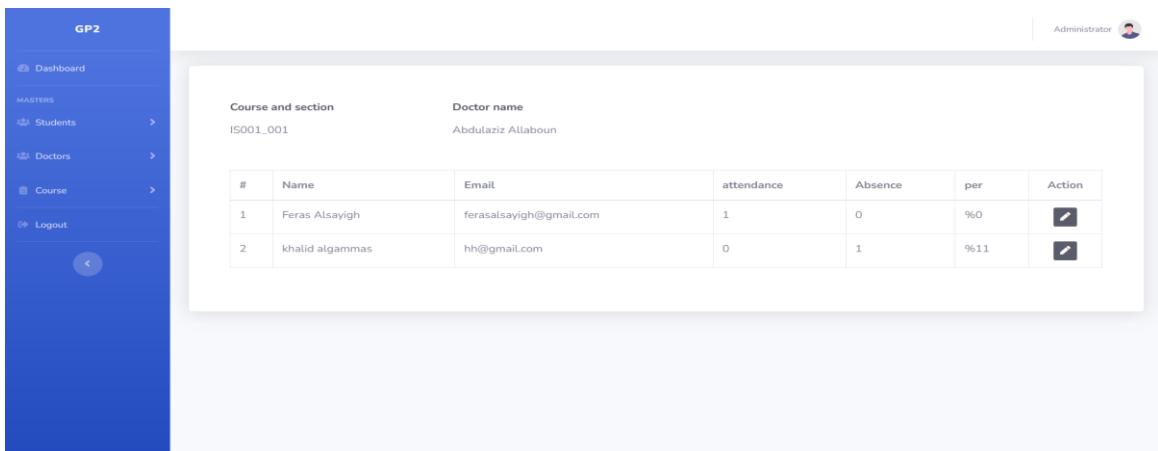


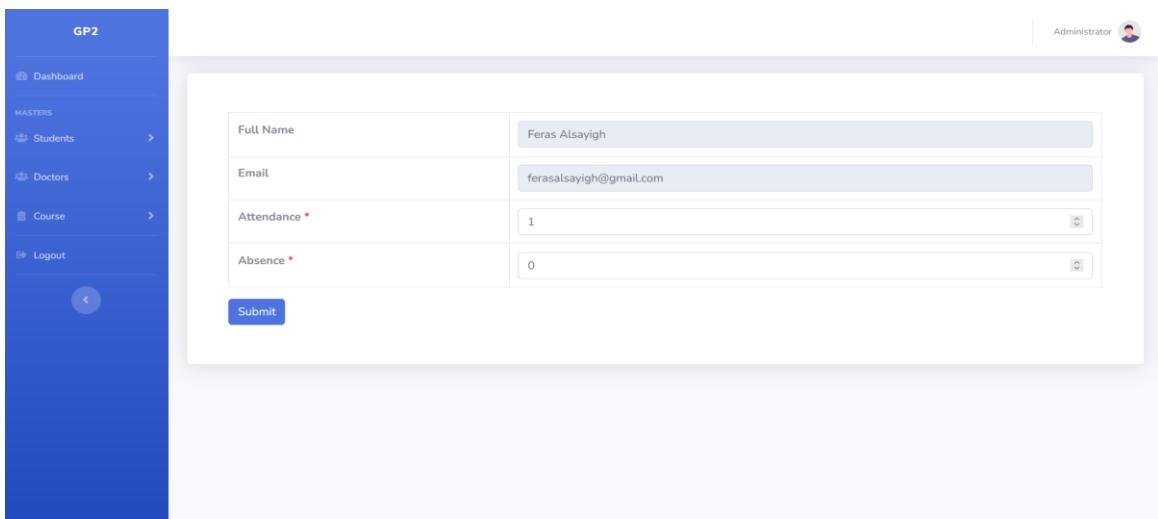
Figure 25 View Courses



The screenshot shows a dashboard titled 'GP2' with a sidebar menu. The sidebar includes 'Dashboard', 'MASTERS', 'Students', 'Doctors', 'Course', and 'Logout'. The main content area displays a table of student attendance and absence data. The table has columns for #, Name, Email, attendance, Absence, per, and Action. Two rows are shown: Feras Alsayigh (attendance 1, absence 0) and khalid algammas (attendance 0, absence 1). The top right corner shows the user 'Administrator'.

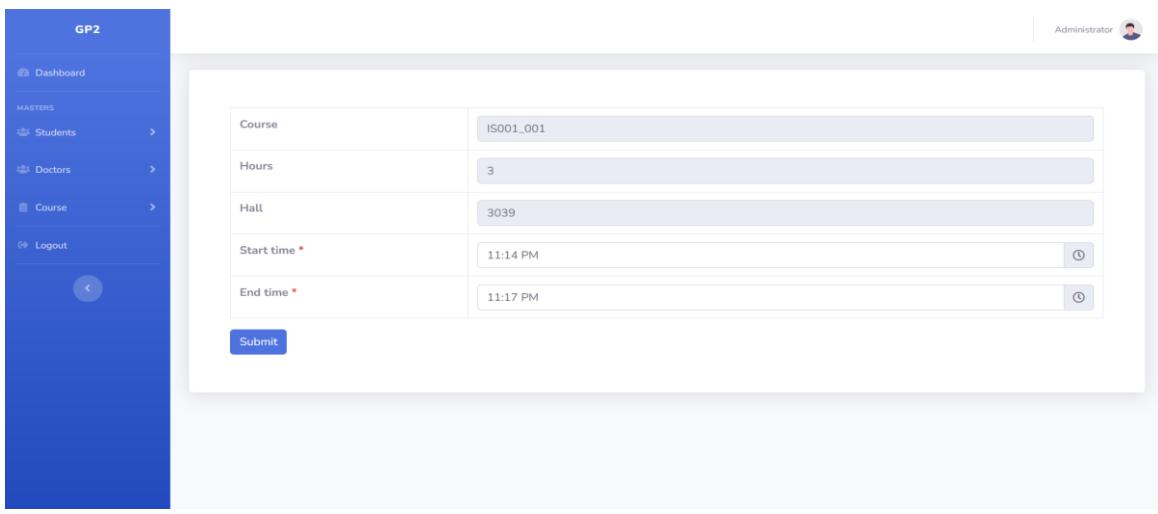
#	Name	Email	attendance	Absence	per	Action
1	Feras Alsayigh	ferasalsayigh@gmail.com	1	0	%0	
2	khalid algammas	hh@gmail.com	0	1	%11	

Figure 26 View Students Attendance and Absence



The screenshot shows a dashboard titled 'GP2' with a sidebar menu. The sidebar includes 'Dashboard', 'MASTERS', 'Students', 'Doctors', 'Course', and 'Logout'. The main content area displays a form for editing student attendance. It has fields for Full Name (Feras Alsayigh), Email (ferasalsayigh@gmail.com), Attendance (1), and Absence (0). A 'Submit' button is at the bottom. The top right corner shows the user 'Administrator'.

Figure 27 Edit Student Attendance



The screenshot shows a dashboard titled 'GP2' with a sidebar menu. The sidebar includes 'Dashboard', 'MASTERS', 'Students', 'Doctors', 'Course', and 'Logout'. The main content area displays a form for editing lecture time. It has fields for Course (IS001_001), Hours (3), Hall (3039), Start time (11:14 PM), and End time (11:17 PM). A 'Submit' button is at the bottom. The top right corner shows the user 'Administrator'.

Figure 28 Edit Lecture Time

The screenshot shows a web-based application interface for 'GP2'. On the left, a blue sidebar menu includes 'GP2', 'MASTERS', 'Courses' (selected), and 'Logout'. The main content area displays a table of course details:

#	Course	Hours	Hall	Start Time	End Time	Action
1	IS001_001	3	3039	11:14 PM	11:17 PM	

Figure 29 Doctor View Course

The screenshot shows a form for editing student attendance and absence. It includes fields for 'Full Name' (Feras Alsayigh), 'Email' (ferasalsayigh@gmail.com), 'Attendance' (1), and 'Absence' (0). A 'Submit' button is at the bottom.

Full Name	Feras Alsayigh
Email	ferasalsayigh@gmail.com
Attendance *	1
Absence *	0

Figure 30 Doctor Edit Attendance and Absence

The screenshot shows a table of student attendance data. At the top, it lists 'Course and section' (IS001_001) and 'Doctor name' (Abdulaziz Allaboun). The table below shows student names, emails, attendance counts, absence counts, and percentages:

#	Name	Email	attendance	Absence	per	Action
1	Feras Alsayigh	ferasalsayigh@gmail.com	1	0	%0	
2	khalid algammas	hh@gmail.com	0	1	%11	

Figure 31 Doctor View Attendance Status

The screenshot shows a student view of course details. The left sidebar has 'GP2' at the top, followed by 'MASTERS', 'Courses', and 'Logout'. The main area displays a table with columns: #, Course, Hours, Start Time, End Time, Attendance, Absence, and Action. There are two entries:

#	Course	Hours	Start Time	End Time	Attendance	Absence	Action
1	IS001_001	3	11:14 PM	11:17 PM	1	0	
2	IS001_002	3	01:26 AM	09:12 PM	0	0	

Figure 32 Student View Courses

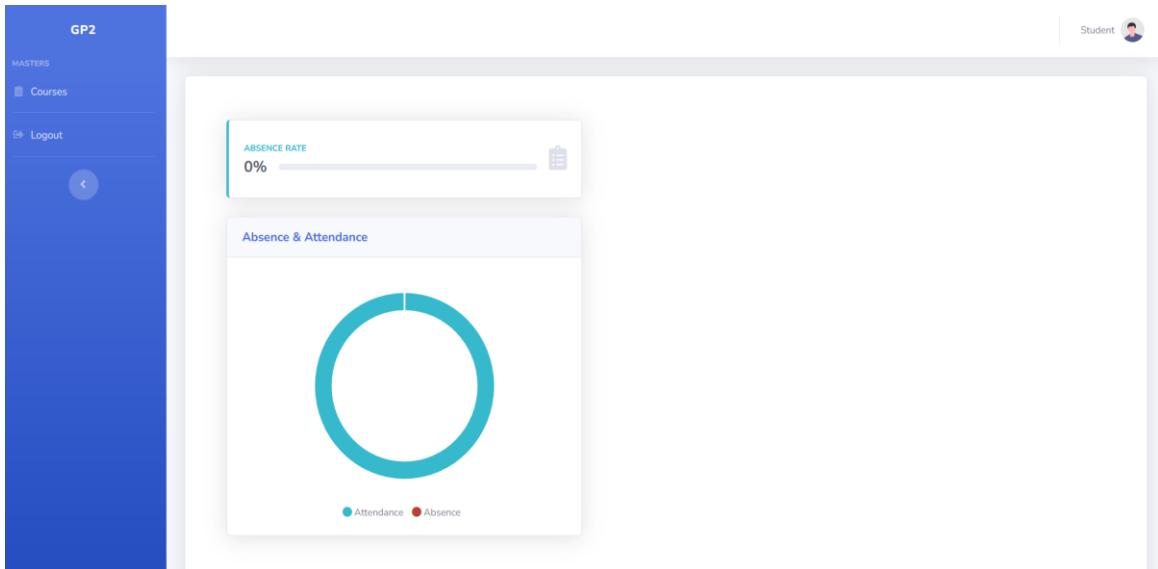


Figure 33 Student Check Attendance Rat

Chapter 5: System Implementation

5.1 System Specification

5.1.1 Hardware Specifications

To set up and utilize the proposed system effectively, it requires two essential hardware components: a computer and a webcam. These two integral devices are all that's necessary to ensure effectiveness operation and functionality within the system.

5.1.2 Software Specifications

In order to successfully install, utilize, and thoroughly test the system, it is imperative to have several key software components in place. Firstly, set up Laravel and PHP to provide the backend infrastructure. Additionally, a web browser is essential for rendering HTML and CSS components that enable the user interface.

Furthermore, to enable the core functionality of the system, Python is a prerequisite. Python serves as the foundation for running various modules, particularly those related to computer vision and facial recognition. Specifically, the OpenCV library and the essential NumPy library for efficient numerical operations should be installed alongside Python to harness the full potential of our system.

Moreover, for database management and storage, XAMPP and MySQL play a pivotal role. These tools provide the necessary environment for organizing and retrieving data efficiently, ensuring an effective operation of the system.

By ensuring the presence of these software components, including XAMPP and MySQL, the computer will be well-equipped to install, utilize, and thoroughly evaluate the capabilities of the system, fostering a smooth and efficient user experience.

5.2 System Testing

For the purpose of achieving a process reengineering of manual attendance system the system needs to integrate Computer Vision Back-end and Laravel Back-end with its front end, linked with the same database.

5.2.1 Features to be tested.

Computer Vision Back-end features:

- 1- Timely scheduled attendance submission.
- 2- Pop up window for camera and Face Recognition

Front-end features:

- 1- Administrator page.
- 2- Doctors page.
- 3- Students page.

Common features of all roles:

- 1- Log-in page.

Front-end and Back-end integration features:

- 1- Register page for students only to upload their images.

5.2.2 Test Cases**Computer Vision Back-end features:**

Pop up window for camera and Face Recognition	
Purpose	To let the student know at the lecture that his attendance was taken and to recognize him in order to mark him attend.
Inputs	Students' names and Images
Expected outputs	Pop up window showing the student's name in a rectangular frame.
Pass/Fail criteria	Pass
Test results	The test sample shows that the student who appears on the camera his name appears, and it recognizes it then submit the attendance. Also, if there's someone who isn't assigned to the lecture it going to show Unknown on the frame.

Table 17 Pop up window for camera and Face Recognition feature

Timely scheduled attendance submission	
Purpose	To determine the time period of the lectures then submit the attendance after each lecture
Inputs	Hall number, time interval of each lecture assigned to the hall and the attendance of each student.
Expected outputs	Attendance and Absence marked for each student
Pass/Fail criteria	Pass
Test results	The test sample shows that the student who appears on the camera at a given time period have been marked as attend and the student who hasn't appeared on the camera have been marked as absent

Table 18 Timely scheduled attendance submission feature

Front-end features:

Administrator page	
Purpose	To view all students, courses/sections, doctors. The ability to modify attendance and lecture time then assign doctors and students to courses. Also, add courses and doctors to the database.
Inputs	<ul style="list-style-type: none"> 1- Add student to course: student name and course. 2- Add doctor to course: Name, Email and Password. 3- Add course: Course title-section, Hours, Start time and end time.
Expected outputs	<ul style="list-style-type: none"> 1- Dashboard showing total students, courses, doctors. 2- View all students.

	<ul style="list-style-type: none"> 3- View all doctors. 4- View all courses. 5- Ability to modify students' attendance/absence and delete them from previous assigned course. 6- Ability to assign doctors to a course. 7- Delete doctor or modify.
Pass/Fail criteria	Pass
Test results	After testing the admin's page, the result met the expected output.

Table 19 Administrator page feature

Doctor page	
Purpose	To view only assigned courses, check each course/section to view all assigned students, display all assigned students to doctor's courses and modify attendance and absence.
Inputs	as a result of the administrator input/output inherit the assigned course/section and students with limitations explained in the output.
Expected outputs	<ul style="list-style-type: none"> 1- View only assigned courses. 2- Check each course/section to view all assigned students to the same doctor course/section. 3- Display all assigned students to the same doctor course/section. 4- Ability to modify attendance and absence of students assigned to the doctor course/section.
Pass/Fail criteria	Pass
Test results	After testing the Doctor's page, the result met the expected output.

Table 20 Doctor page feature

Student page	
Purpose	To view only assigned courses and attendance rate.
Inputs	as a result of the administrator input/output inherit the assigned course/section with limitations explained in the output.

Expected outputs	1- View only assigned courses by admin. 2- Check each assigned course for absence rate as well as attendance and absence count.
Pass/Fail criteria	Pass
Test results	After testing the student's page, the result met the expected output.

Table 21 Student page feature

Common features of all roles:

Log-in page	
Purpose	For all roles to enter the system.
Inputs	1- E-mail 2- Password
Expected outputs	For each role send them to their appropriate page.
Pass/Fail criteria	Pass
Test results	After logging in for each role the test has shown that each role have been sent to its appropriate page.

Table 22 Log-in page feature

Front-end and Back-end integration features:

Register page	
Purpose	For students to upload their images for Face Recognition and be able to enter their students'.
Inputs	1- Name. 2- Email. 3- Password 4- Personal picture
Expected outputs	1. The ability to take students' attendance and enter the student's page.
Pass/Fail criteria	Pass
Test results	The attendance is successfully taken, and the pages show their attendance.

Table 23 Register page feature

5.3 System Deployment

5.3.1 Deployment Diagram

The Figure demonstrates the four deployment components.

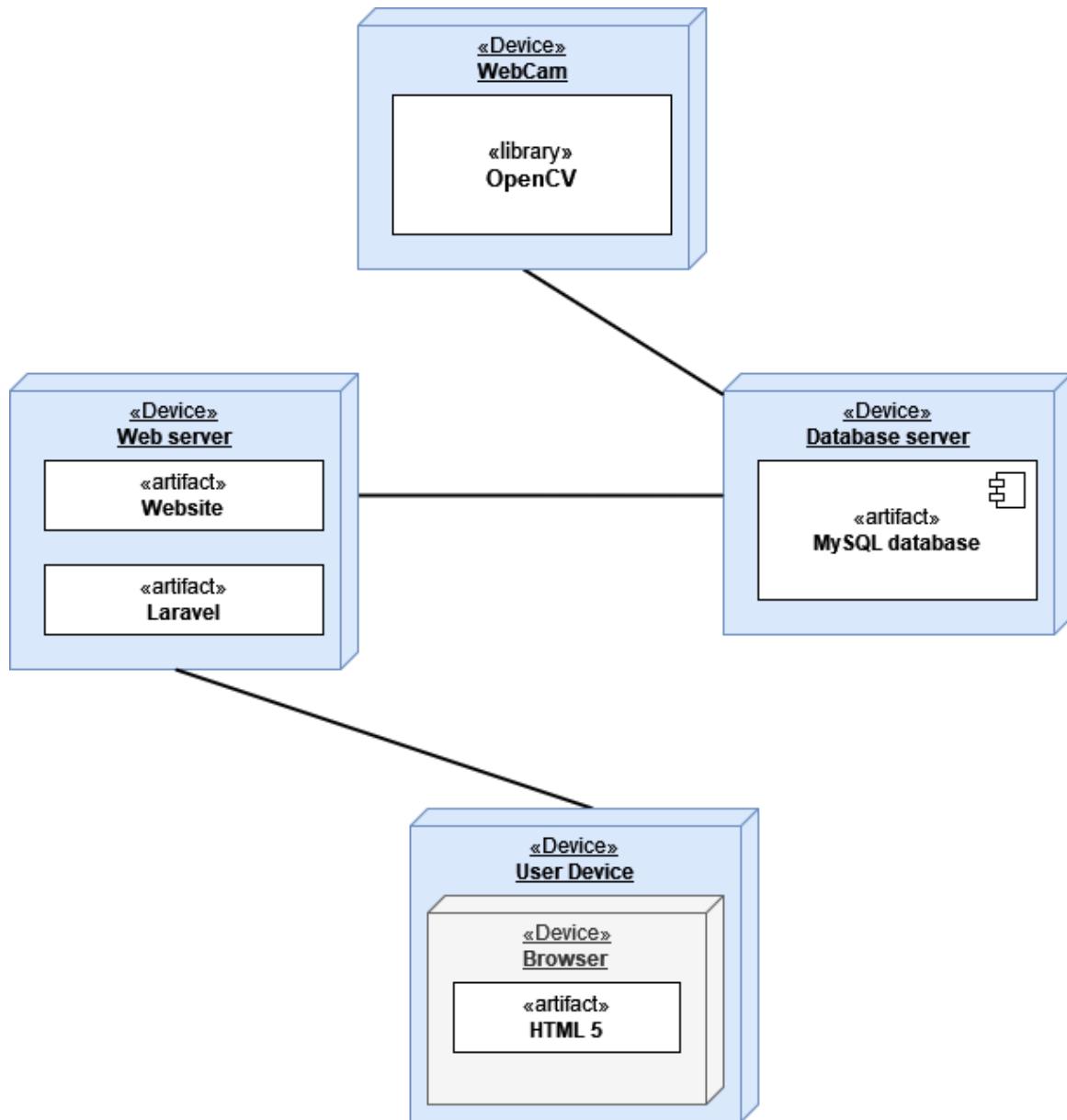


Figure 34 Deployment Diagram

5.3.2 Expected Users/Load

To answer this question, we need to divide it into two categories Face Recognition and front-end. When it comes to face recognition, the load is one since it already has the students loaded into the database it going to download the image of the section then start taking the attendance.

On the other hand, the Front-end is going to need about one-third of actual users there since the load is about simultaneous users entering at a given time one-third of students is sufficient to our system.

5.3.3 Installation Process

- 1- Install composer.
- 2- Install XAMPP.
- 3- Install Python.
- 4- Install Pip.
- 5- Install OpenCV.
- 6- Install Face Recognition.
- 7- Install Numpy.

Chapter 6: Conclusion and Future Work

6.1 Conclusion

In conclusion, the researchers made a process reengineering of the manual attendance system resulting in saving the lecturer and students' time. Alongside taking the attendance of students through computer vision combined with developing an automated process to take the attendance. by addressing the time of each lecture and hall, once it ends the submission will automatically be inserted to the database. Giving the student an ability to check his attendance immediately. Also, the lecturer will have the ability to modify each student's attendance assigned to his courses.

One of the obstacles during the development is the learning process of computer vision. Since it has not been addressed as a course by the Information Systems Department in addition to learning Python and Laravel framework. The solution that we made to overcome this obstacle is self-learning through Internet and take additional courses to develop the project.

The project gave us the opportunity to expand our knowledge through self-development, gain time management skills as well as teamwork skills.

6.2 Future Work

To extend the project and deploy it in the most seamless manner.

- Make it a central computer with multi-thread for each hall so the deployment and installment would be also standardized.
- Centralized computer with multi-cameras for each hall.
- Add APIs to both back-ends to make the admin handle python from a graphical user interface.

References

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- [2] L. R. P, "IMPACT OF TECHNOLOGY IN HUMAN LIFE," *GLOBAL JOURNAL FOR RESEARCH ANALYSIS*, vol. 6, no. 9, pp. 106-107, 2017.
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Appendix

A. Miscellaneous

Questionnaire Form

مشروع تخرج يهدف الى تطوير نظام الحضور والغياب.

السلام عليكم ورحمة الله وبركاته
نون طلاب قسم نظم المعلومات من كلية الحاسوب في جامعة الإمام محمد بن سعود الإسلامية تهدف إلى تطوير طريقة التحضر فالجامعات من يدوي إلى الكتروني وأمكانية الطالب بمتابعة ومعرفة حضوره في كل مادة من خلال الموقع الخاص بالتحضر.
نحتاج إلى مساعدتك فيه الإجابة على بعض الأسئلة التي تساعدنا في إتمام مشروع التخرج بالشكل الصحيح

* هل سبق وأن تم التحضر بعد الانتهاء من الوقت الفعلي للمحاضرة؟
?Have the lecturer ever took the attendance after the actual time of the lecture

نعم
لا

* هل تفضل أن ترى نسبة حيبارك وحضورك من خلال موقع أو تطبيق؟
?Do you prefer to see your attendance rate in each course via an app or website

نعم
لا

Figure 35 Questionnaire Form 1

* هل سبق وأن شهدت تحضير طالب غير موجود؟
?Have you ever witnessed an impersonation of attendance

نعم
لا

* هل ترى أن التحضر يأخذ من وقتك أو وقت المحاضرة؟ أم لا
?Does the attendance process take some of your own time or the lecture itself

نعم
لا

* هل سبق وتم تخفيشك رغم حضورك؟
?Have you ever been marked absent even though that you were present

نعم
لا

Figure 36 Questionnaire Form 2

* هل سبق وان تم حرمانك من مقرر دون علمك؟
 ?Have you ever been forbidden from a course without your knowledge

نعم

لا

Figure 37 Questionnaire Form 3

Questionnaire Form Dashboard

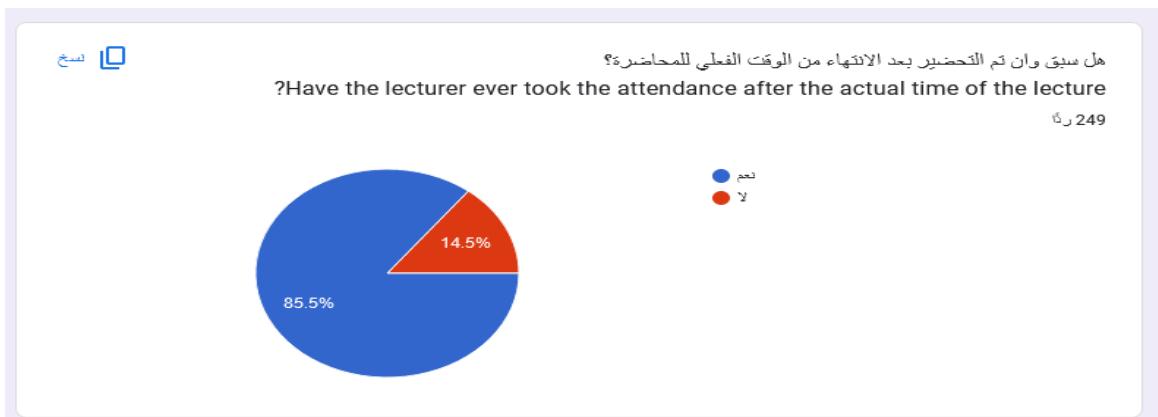


Figure 38 Questionnaire Form Dashboard 1

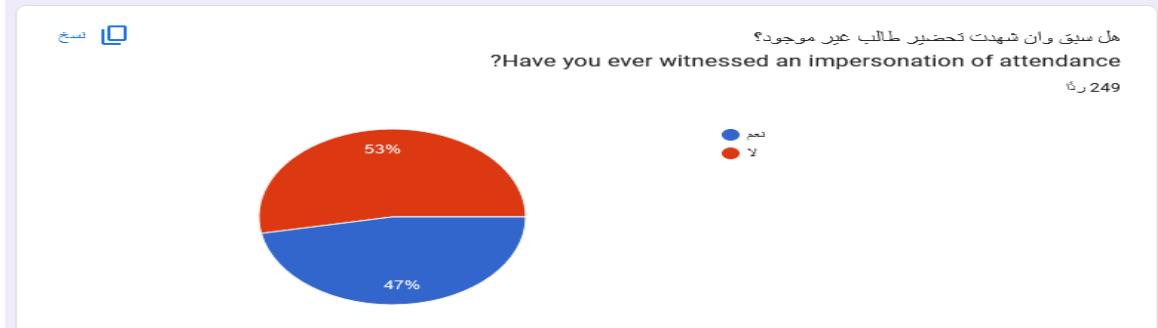
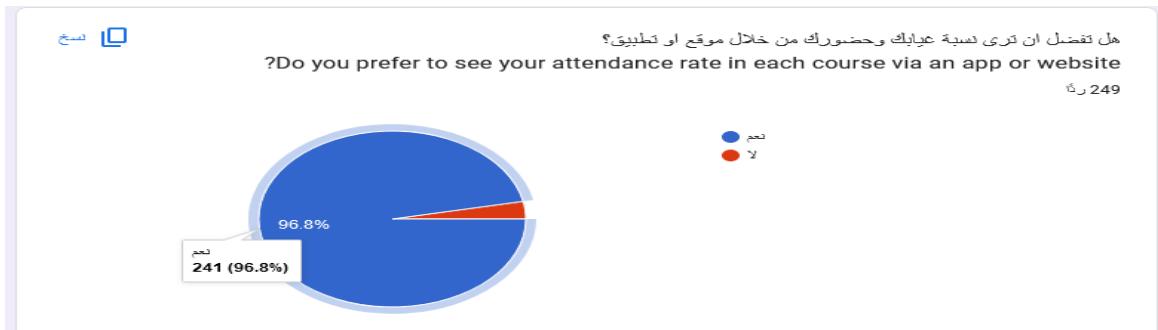


Figure 39 Questionnaire Form Dashboard 2

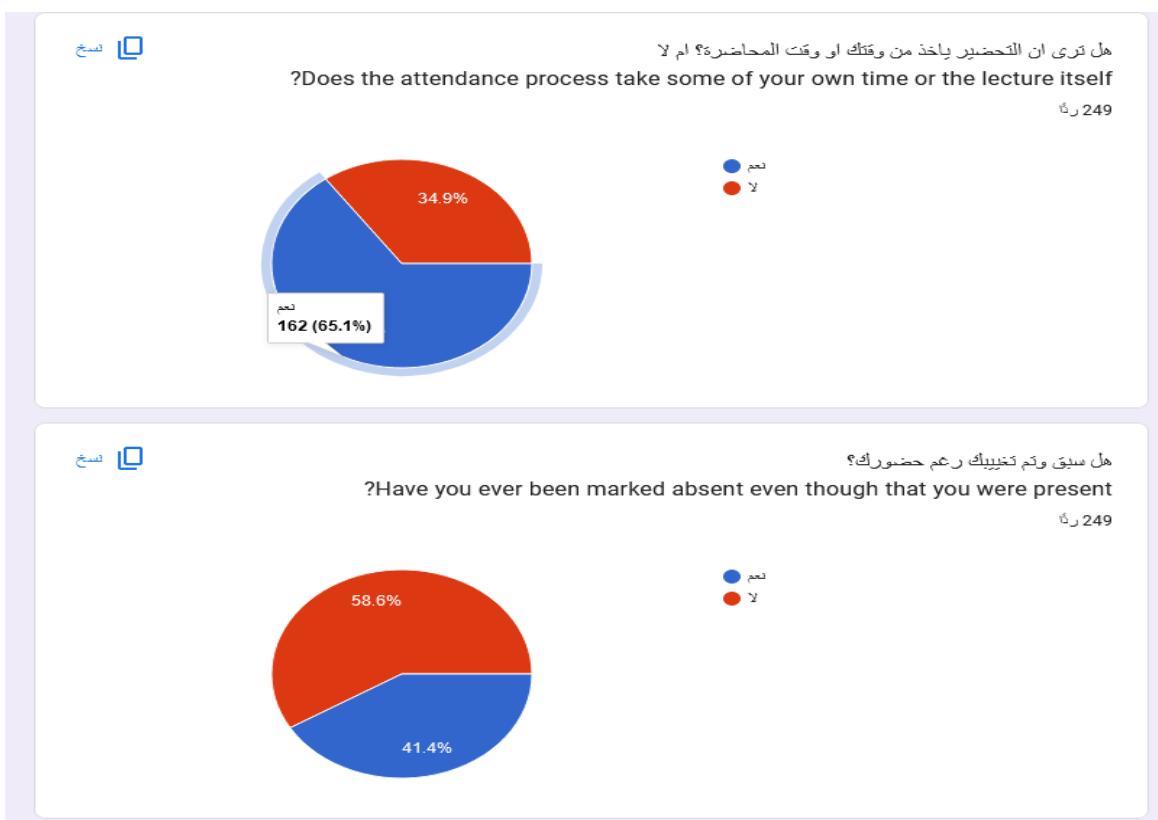


Figure 40 Questionnaire Form Dashboard 3

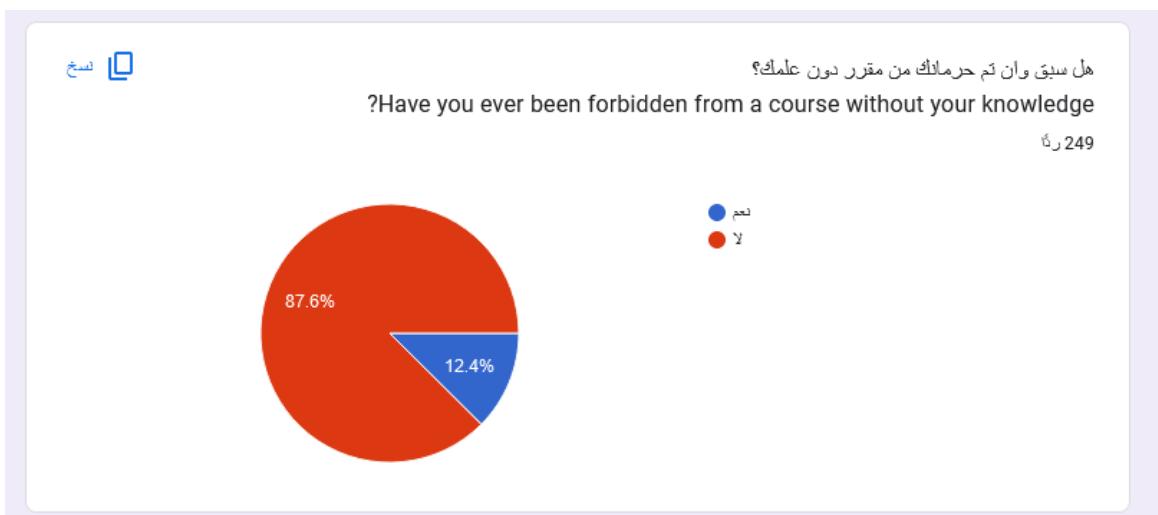


Figure 41 Questionnaire Form Dashboard 4

Form Link: https://docs.google.com/forms/d/e/1FAIpQLSdCePR2Ol4E2-78t4G85tLMKfAd3QWsQq-Zer21WoPQ_xd4-Q/viewform?usp=sf_link

B. Code Snippets

Query for taking the lecture time and through the hall number and code for fetching.

```
178 mycursor.execute("SELECT courses.id, courses.start_time, courses.end_time FROM courses WHERE courses.hall = {} ORDER BY co
179
180 course_start_end = mycursor.fetchall()
181 course_array = []
182 start_time_array = []
183 end_time_array = []
184 convert_inatial = datetime.time(00, 0)
185 print("course st end ", course_start_end)
186 for fetching in course_start_end:
187     course = fetching [0]
188     course_array.append(course)
189     start_time = (datetime.datetime.combine(datetime.date.today(), convert_inatial) + fetching[1]).time()
190     # start_time = fetching[1]
191     start_time_array.append(start_time)
192     end_time = (datetime.datetime.combine(datetime.date.today(), convert_inatial) + fetching[2]).time()
193     # end_time = fetching[2]
194     end_time_array.append(end_time)
195     # current_time = datetime.datetime.now()
196     # current_time = current_time.now()
197     # print(current_time)
198     print("course: ", course)
199     print("course array: ", course_array)
200     print("start time: ", start_time)
201     print("start time array: ", start_time_array)
202     print("end time: ", end_time)
203     print("end time array : ", end_time_array)
```

Figure 42 Code 1

Lectures Scheduling code.

```
210 # schdeule lectures
211 for SchTimeStart, SchTimeend, SchTimecourse in zip(start_time_array, end_time_array, course_array):
212
213     print("Elements: ", SchTimeStart, SchTimeend, SchTimecourse)
214
215     schedule.every().day.at(SchTimeStart.strftime("%H:%M")).do(lambda course=SchTimecourse, end=SchTimeend: job(course, end))
216
217
218
219     while True:
220         schedule.run_pending()
221         time.sleep(1)
```

Figure 43 Code 2

Face Recognition

```
while current_time <= end_time:
    # current time update escape loop when time ends
    current_time = datetime.datetime.now().time()
    print("Attendance Started")
    time.sleep(1)
    loop = 0

    ret, frame = cap.read()

    face_locations, face_names = sfr.detect_known_faces(frame)

    for face_loc, name in zip(face_locations, face_names):
        y1, x2, y2, x1 = face_loc[0] , face_loc[1] , face_loc[2], face_loc[3]

        cv2.putText(frame , name, (x1, y1 - 10), cv2.FONT_HERSHEY_DUPLEX, 1, (255, 255, 255), 2)
        cv2.rectangle(frame, (x1, y1) , (x2, y2) , (200, 0 , 0), 4)
```

Figure 44 Code 3

Attendance taken process with update attend query.

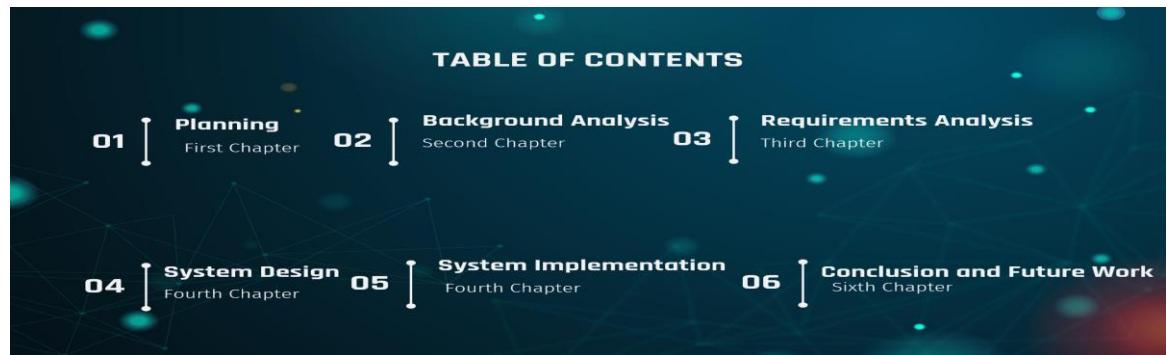
```
for std in stds:
    names ="".join(std[1])
    attendcount = std[2]
    ID = std[0]
    try:
        Face_Name ="".join(face_names[0])
        for j in arr:
            print("here")
            if j == Face_Name:
                print(Face_Name)
                print(j)
                loop = 1

        print("names: "+ names +"loop=", loop)
        if Face_Name == names and loop == 0:
            attendcount = attendcount + 1
            print(attendcount)
            print(ID, names, attendcount)
            t = (attendcount , names, ID)

            sql = "UPDATE student_course SET attendance = {} WHERE student_id = {} AND course_id = {}".format(attendcount, ID ,courseID)
            mycursor.execute(sql)
            mydb.commit()
            arr.append(names)
```

Figure 45 Code 4

C. Presentation Slides



Project Overview

This Project aims to use OpenCV tool to detect human faces then recognize each student Even if its moving with object tracking. Then the system will submit the students' attendance afterward.

Problem Statement

Ideal Scenario

each lecture attendance taken is manually done and registered at the end of the semester by the lecturer.

Consequences

it takes time and involves the use of sheets. This method could easily allow for impersonation and the attendance sheet could be stolen or lost.

Suggestion

Face recognition automated attendance system for keeping track of the students' attendance, automatically submit it and let the students be aware of the attendance rate

Main Project Question

How to implement automated computer system in Imam university for checking students' attendance, especially with the increasing number of students every year ?

Project Goal



The main goal of the project is to develop a student attendance system utilizes machine learning technology to recognize students' faces and attend them to keep track of students' attendance in a convenient way for the lecturer.

Objectives

- | | |
|---|--|
| 1 | To examine the current status of attendance system that are implemented in advanced countries. |
| 2 | To investigate and analyze current technological infrastructure and efforts of Saudi universities towards establishing attendance system. |
| 3 | To identify problems in the school of computer and information science regarding such issues. |
| 4 | Develop a web-based application system for student's attendance based on machine learning techniques to manage courses Students and Lecturers. |
| 5 | Test the proposed system in real life to advantage of this new student attendance system. |

Project Scope

Boundaries

- 01 Aim to serve any Academic Facility
- 02 It would be deployed to mobile as well as computer.
- 03 It would show the students their attendance rate at their courses, the lecturer could modify it
- 04 The administrator would have the full authorization of the Application.

Limitation

- 01 It wouldn't be able to take the lecturer attendance.
- 02 Students do not modify their attendance only check their attendance.

Background Analysis

02
Second Chapter

Possible Solutions

MATCHING SEQUENCE
Correct sequence student can attend
adapting with different user

Radio Frequency Identification (RFID)

Fingerprint Recognition

Criteria

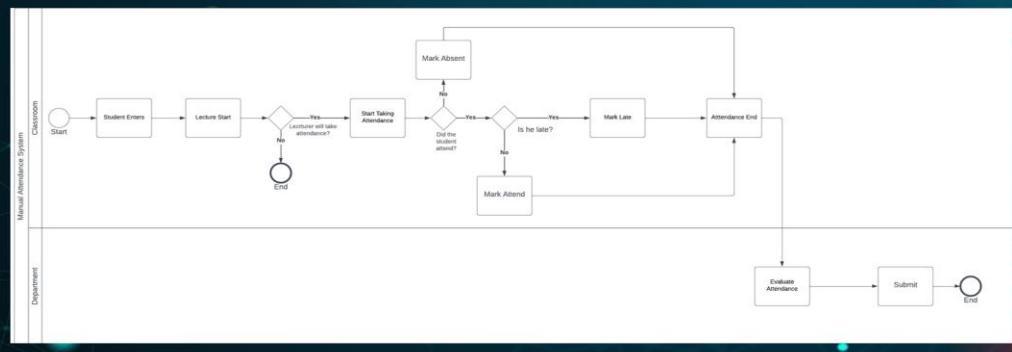
Solutions	RFID	Fingerprint Recognition	Face Recognition
Benefits			
Time Consuming	Yes	Yes	No
Impersonation	Yes	No	No
Stole or Lost	Yes	No	No
Physical Interaction	Yes	Yes	No

The Chosen Possible Solution

After Choosing the main criteria and conducting the Table. The Researchers came to conclude that the best possible solution is Face Recognition.

Existing Business Processes

Manual Attendance System (BPMN As-Is)



Requirements Analysis

03

Third Chapter

Requirement Gathering Summary Results



Questionnaire and Surveys Technique

A gathering technique that is desirable to obtain input from large number of people. It's document containing several standard questions that can be sent to many individuals.

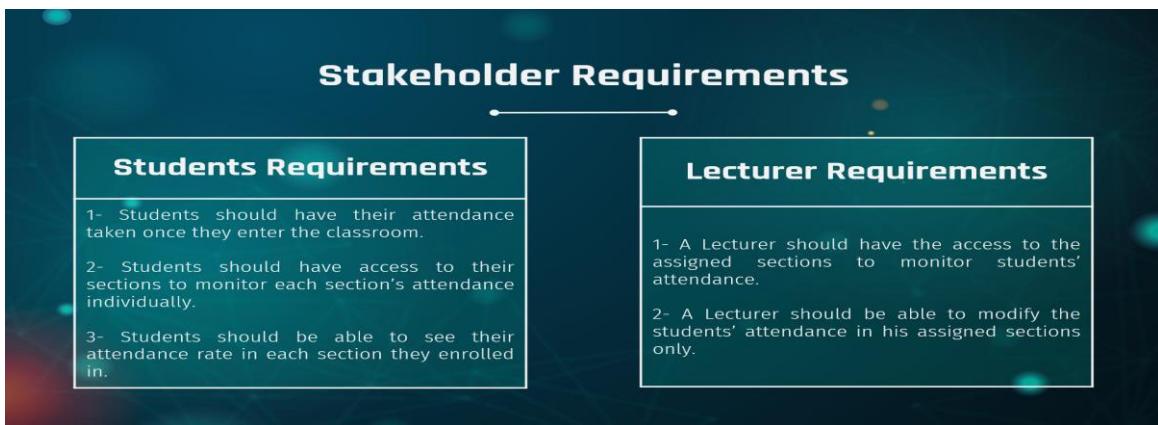


Brainstorming Technique

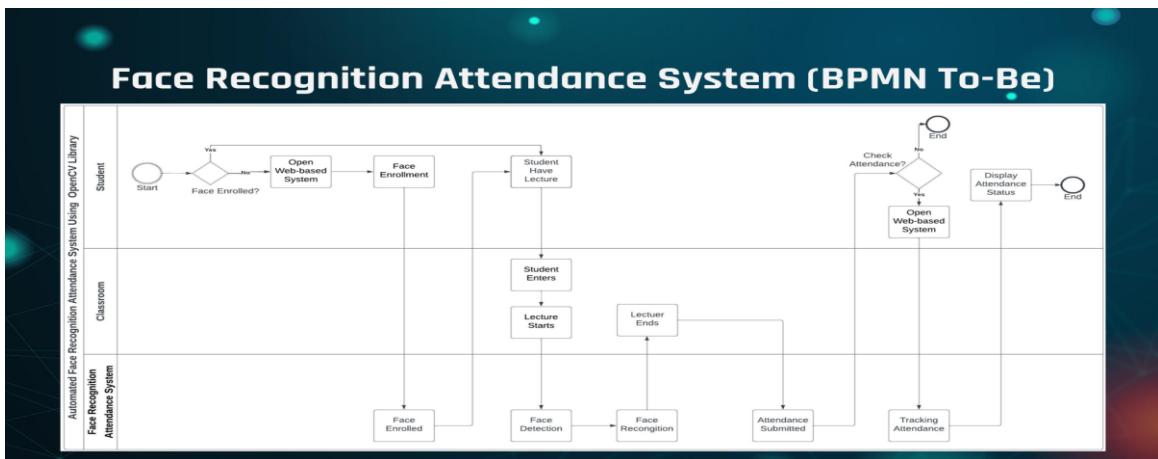
refers to a small group discussion of a specific problem, opportunity, or issue. This technique encourages new ideas, allows team participation, and enables participants to build on each other's inputs and thoughts.

Summary Results

After conducting both techniques, The researchers conducted both functional and non-functional requirements. Which would be identified and the next sub-sections

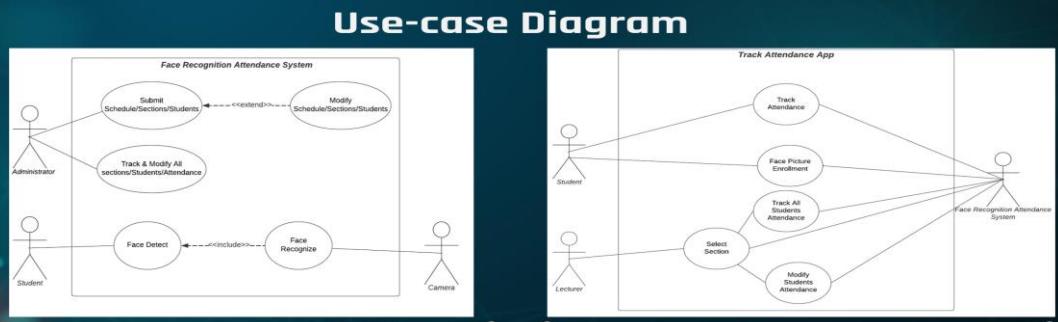


Proposed Business Process



Functional Requirements

The Researchers conduct the major functionality in multiple systems "Face Recognition Attendance System" for taking the attendance and store it into a database and "Track Attendance Application" to monitor the attendance status which would be explain in a Use-case Diagram



Non-functional Requirements

The Researchers divided the main non-functional requirements criteria into three categories which are Reduce Time consuming, Minimize impersonation and Usability.

Non-functional Requirements

Reduce Time consuming

- 1- There must be no physical interaction during the process of taking the attendance to reduce the time.
- 2- Students will be able to see their attendance without talking to the lecturer which reduce time.
- 3- The attendance submission should be after the lecture for the student to see them directly which reduce time.
- 4- The lecturer should not have to collect and submit the attendance to reduce time.

Usability

- 1- Making the web-based application easy to use for the stakeholders with clear words and buttons to make them increase in usability and learnability.
- 2- Making the web-based application multiplatform to for ease of access and increase compatibility.

Minimize impersonation

- 1- Make the process of taking the attendance fully automated with face recognition camera to minimize impersonation..

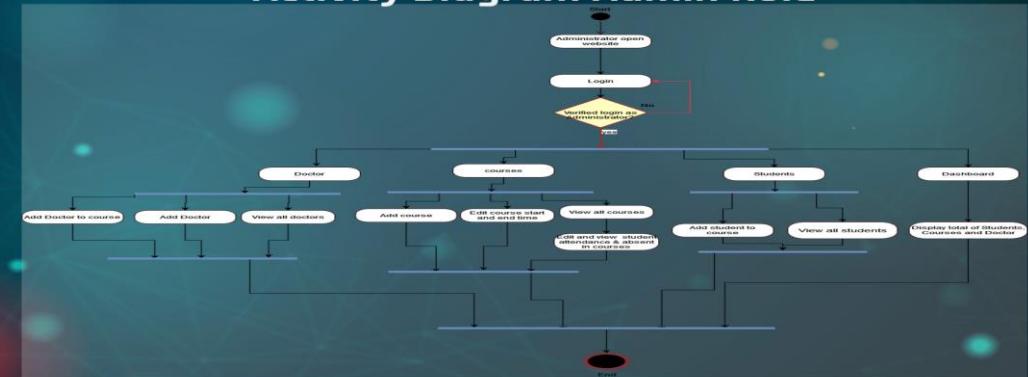
System Design

04

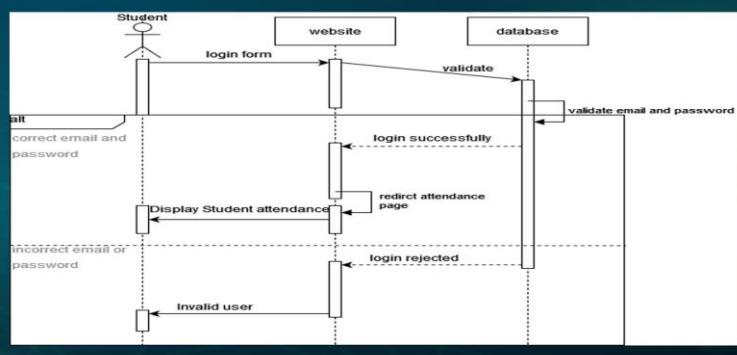
Fourth Chapter

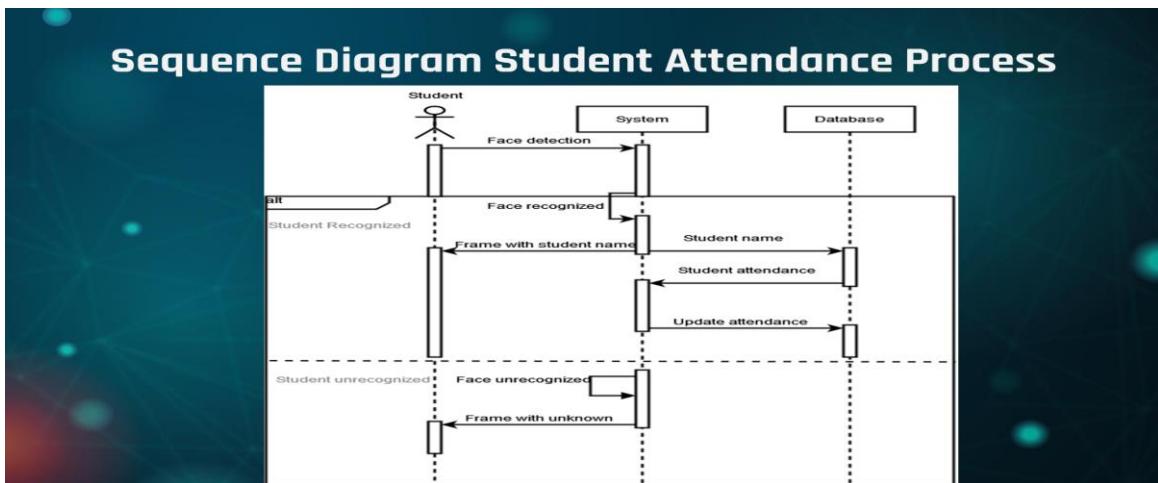
System Modelling

Activity Diagram Admin Role

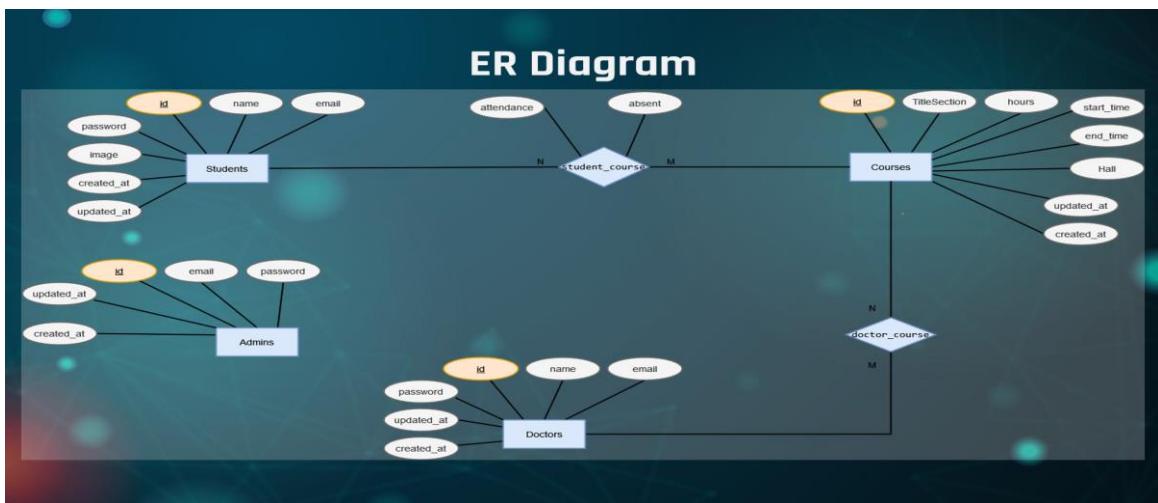


Sequence Diagram Student Role



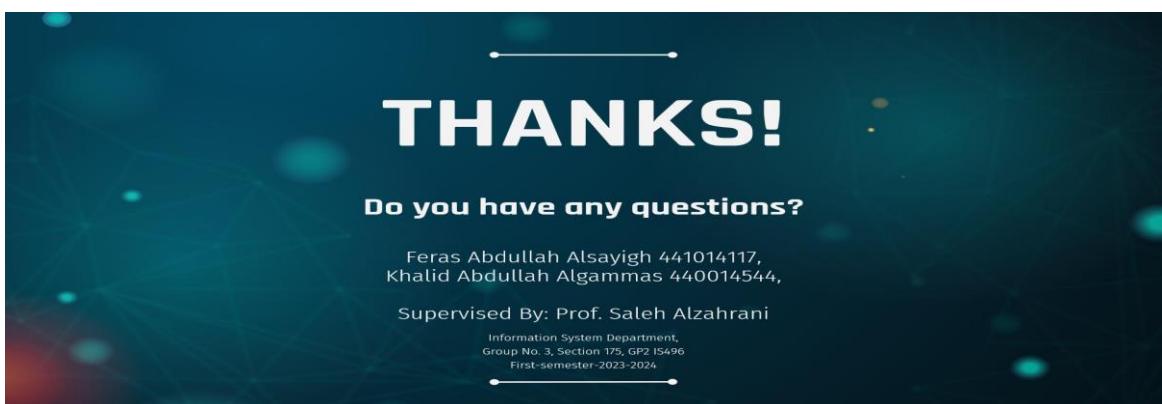
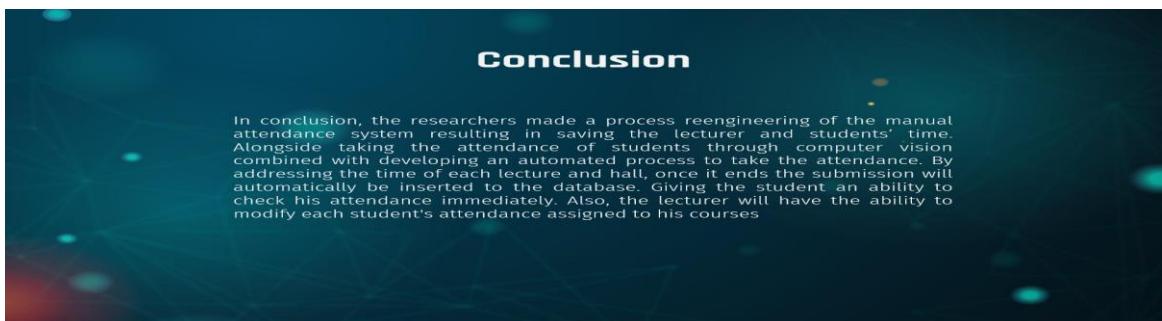


Data Modelling



System Implementation 05

Fifth Chapter



D. Poster



Face Recognition Attendance System Using OpenCV Library

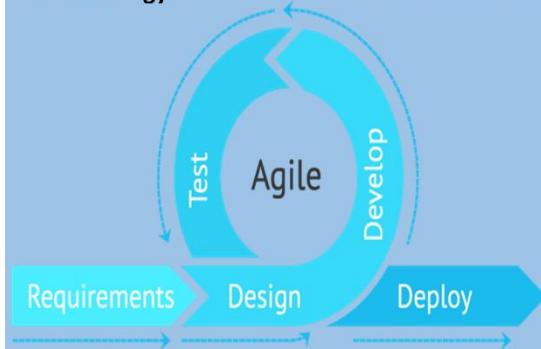


Introduction: This Project aims to use OpenCV tool to detect human faces then recognize each student Even if its moving with object tracking. Then the system will submit the students' attendance afterward.

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1. To examine the current status of attendance system that are implemented in advanced countries.
2. To identify problems in the school of computer and information science regarding such issues.
3. Develop a web-based application system for student's attendance based on machine learning techniques to manage courses Students and Lecturers.
4. Test the proposed system in real life to advantage of this new student attendance system.

methodology:



Feras Alsayigh and Khalid Algammas
Supervisor: Prof. Saleh Alzahrani

Conclusion: the researchers made a process reengineering of the manual attendance system resulting in saving the lecturer and students' time. Alongside taking the attendance of students through computer vision combined with developing an automated process to take the attendance.

Future: To extend the project and deploy it in the most seamless manner

- Make it a central computer with multi-thread for each hall so the deployment and installment would be also standardized.
- Centralized computer with multi-cameras for each hall.
- Add APIs to both back-ends to make the admin handle python from a graphical user interface.

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❖ The more in the document.

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