A Decision Support System for Symptom Based Common Diseases

By

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This Report Presented in Partial Fulfillment of the Requirement for the Degree of Master of Science in Computer Science and Engineering

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APPROVAL

This Thesis titled "**A Decision Support System for Symptom Based Common Diseases**" submitted by Taslima Sumi, ID No: 211-25-935 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of M.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 21-09-2022.

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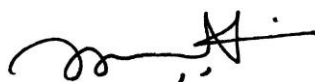Faculty of Science & Information Technology
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DECLARATION

I, Taslima Sumi hereby declare that, this thesis has been done by me under the supervision of **Professor Dr. Md. Ismail Jabiullah, Professor, Department of CSE** Daffodil International University. I also declare that neither this thesis nor any part of this thesis has been submitted elsewhere for award of any degree or diploma.

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ACKNOWLEDGEMENTS

First, I express my heartiest thanks and gratefulness to almighty God for His divine blessings makes me possible to complete the final year thesis successfully.

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I would like to thank my entire course mate in Daffodil International University, who took part in this discuss while completing the course work.

Finally, I must acknowledge with due respect the constant support and patients of my parents.

ABSTRACT

"A Decision Support System for Symptom Based Common Diseases" is a System that can predict the disease by selecting systems by user added. It can also suggest a doctor and other hospital-related facilities. In this pandemic situation, people should avoid visiting a doctor in a hospital and crowded place. But people need to be a treatment for their various diseases and at any time. This application will work as a virtual doctor, where people can choose their symptoms which are they suffering. After analyzing those symptoms, this application will predict the disease list with a percentage. In this way, people will able to get suggestions and treat themselves. The system is to make people ensure about their proper disease by checking symptoms. It will also help the people to know about recovery steps to cure. The system will decrease the risks factor which nay happens by visiting hospitals in this pandemic situation. This Android Application is a reliable and secure application for Predict Bot field. It is complete automation of operations. It can also reduce manpower and best use of men's power. And also by using this system one can easily have a startup business of their own.

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1.1 Introduction

At present, every human wants to get better treatment from their house. So that, they are depending on different telemedicine application. This application will be another opportunity to take telemedicine service better than past. A patient can identify the specific disease by checking symptoms. This will help them to get idea about which types of specialist they have to visit. Besides, they can get the location of doctors' location with details. There have a number of doctors of different categories. So that, it will be easy to get service from any of them.

Overview: many times people are unable to go doctor physically for many reasons. They can get better service by using this application. About many people were attacked by covid-19 in the hospital area. So that, people want a solution to this problem. [1]

This kind of pandemic situation happened a lot of times before. Pandemic situation is getting worst for making crowd in different places. Hospital or this kind of places is red zones for the pandemic situation.

This application will help people to save the time. They can notify about their disease and besides, they will know about the curable process. Besides, patients can be updated with their prescriptions, lab test activities, medicine alarm, blood donor, ambulance, and some very much important features which are related to sound health.

1.2 Problem Background

There have a number of people, who cannot take proper treatment from telemedicine. Because of they cannot understand which specialist is perfect for them. Besides, there are a number of people who almost every day forget to take medicine. They need a drug reminder system for taking medicine regularly. For this reason, they suffer critical disease as usual times. They can't get an attachment to a doctor for different reasons. They are not able to pay doctor fees; they have no idea who is the best doctor for their diseases. Because they don't know about their diseases, there has no system to know about their disease by checking existing symptoms.

People cannot save their medicine alarm time in any system. They cannot save their prescriptions, lab test, or any other report anywhere. For this reason, while they go to buy their medicine, they need to carry their prescriptions along with them. Sometimes, they may lose their prescriptions. [2]

1.3 Purpose

The purpose is to develop this android application is helping people to make sincere about their weak health.

1.4 Objectives

➢ To make ensure proper diseases by checking symptoms. People will be able to select their symptoms, age, and gender. For this reason, people should not go to the doctor for as usual diseases. They can get suggestions and make a proper treatment easily.

➢ To know those recoveries steps this can help them to cure. Besides, keeping a record of their prescriptions, record of their lab test report and make reminder the medicine time.
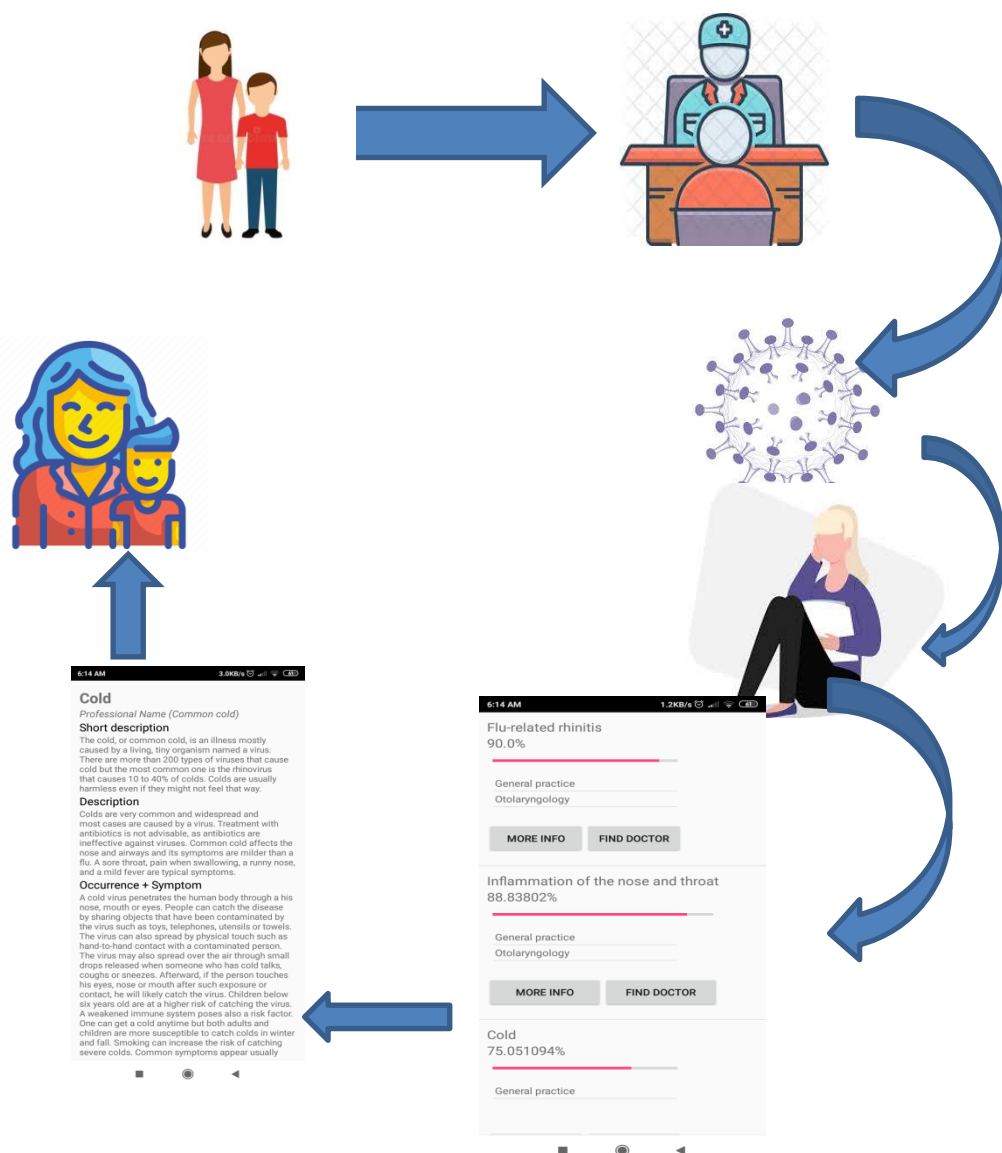
1.5 Methodology of this system:

Figure: 1.5 Methodology of this application

The methodology is particular produce or set of procedures. From figure: 1.1 in this covid-19 pandemic situation if people go to the hospital for treatment then it higher risks to positive covid-19 or the influence of disease. People can avoid this situation by using this application.

1.6 Motivation

In this pandemic situation, meet a doctor in the hospital is a risk. There are some reasons which are motivated me to do this project. They are:

➢ To create awareness among people about different kinds of diseases and their treatments.

➢ Suggest doctors and locations for booking appointments based on the diseases.

➢ Learn about all kinds of health tips and healthy food information about diseases.

➢ To make it easy to save prescriptions.

➢ To save medicine alarm and can be alert in time to take medicine

➢ Through these processes, people can make a sound and better life.

Chapter 2

Literature Review

2.1 Existing Work

Health related application is right now available with different features. In this chapter,

I discuss about existing applications. Besides, limitation also is discussed in this chapter.

- Expose the same work with present system.
- Add existing task is connected with others.
- Summated the data got from the research.

2.2 Existing Applications Review

"Disease Prediction System for Common Symptoms" is an android application that helps People to keep all health required to save and monitor. The system of the Disease Prediction for Common Symptoms refers predicting the disease by checking symptoms dynamically with and repair being prompted by these observations. Though these apps try to serve the same purpose at the same time they have a lot of limitations. Here we have tried to point the main features and limit of these existing applications and have tried to show the solution of these limitations solved in Disease Prediction System for Common Symptoms.

Table 2.1: Existing application features

Doctoral

Ref	Features	Limitation
[3]	➤ Can search for a patient according to specialty and location. ➤ Can see patient's available slots. ➤ Can get a reminder of the appointment. ➤ Book an appointment with a doctor. ➤ Get suggestions by video or audio call.	➤ Doesn't have an option to store the patient's necessary treatment records. ➤ Have no option to request for treatment of helpless people.

Table 2.2: Existing application features

Anderson Health

Ref	Features	Limitation
[4]	➢ Glucose Monitors ➢ Blood Pressure Monitors ➢ Weight Scales ➢ Ear Thermometers ➢ Finger Pulse Ox meters. ➢ Book an appointment with the doctor. ➢ Get suggestions by video or audio call.	➢ Doesn't have any medicine alarm system. ➢ Doesn't have an option to store the patient's necessary treatment records. ➢ Have no option to request for treatment of helpless people.

Table 2.3: Existing application features

Health & Fitness Tracker with calorie counter:

Ref	Features	Limitation
[5]	➢ To set goals for - Weight loss, Weight gain, Macronutrients, Calories, Water intake, Sleep time & Daily step count. Blood Pressure Monitors ➢ Eat better for a built-in Calorie Counter with over 2 Million foods. Create custom foods & meals Ear Thermometers	➢ Doesn't have any medicine alarm system. ➢ Doesn't have an option to store the patient's necessary treatment records. ➢ Have no option to request for treatment of helpless people.

Chapter 3
Methodology

3.1 Overview

"A Decision Support System for Symptom Based Common Disease" is an application is a good sense to people about their health, diet, and diseases. By using this application, people will get an idea about their disease by checking their symptoms. People view and save prescriptions or lab test report into this application. People will find out the blood donor and ambulance easily.

3.2 Front End

- ➢ Can check disease probability by checking symptoms
- ➢ Have to Registration first with the required information
- ➢ Then sign in his profile
- ➢ Upload Prescriptions
- ➢ Upload Lab test Report

After getting registered user will get their panel where they will get their profile. Besides, without registration, they can check their diseases. After registration, they will get their profile. Where people can upload their prescriptions. Besides, they can upload their lab test report. Which can help them to ignore carrying reports and prescriptions always along with them. People will know about their BMI and needed calories. Besides, people can save their diet list. People can save their prescriptions and lab test report into this application. People will find out the blood donor and ambulance easily.

3.2.1 Dataset for Common Disease

For providing the valid disease prediction, the prediction method has to use a dataset. This dataset has 133 columns, 132 parameters, where 42 different diseases these diseases are suffered by many people. The dataset used for common disease prediction is given below:

# continuous_sneez...	# shivering	# chills	# joint_pain	# stomach_pain
0	0	0	0	0
1	1	1	0	0
0	0	0	0	1
0	0	0	0	0
0	0	0	0	1
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0
0	0	0	0	0

Figure 3.2.1: Dataset for common disease

Every symptom's probability of occurrence for several diseases is not the same. It varies from disease to disease. Using Support Vector Machine (SVM), we classified the probability of the diseases.

3.2.2 Data Visualization

For visualizing data, there has some technology. We have used android application.

Because, nowadays android is a popular operating system for general people. Every

person can operate this device. So that, I choose android application for implementing

and visualizing the project into android

3.3 Implementation Using Web Scraping

Web scraping, web harvesting, or web data extraction is data scraping used for extracting data from websites. We have used this process to extract data from a web API for our prediction results.

Table 3.3.1: Common parameters

Parameter	Type	Values
Token	String	Security token received from https://authservice.priaid.ch/login
Format (optional)	String	json.xml

Table 3.2: Proposed Symptoms

URL	https://healthservice.priaid.ch/symptoms/proposed
Parameter	token, symptoms, gender, year of birth
Authorization	Token

After getting data from these apis, this activity can get all symptoms as a list:
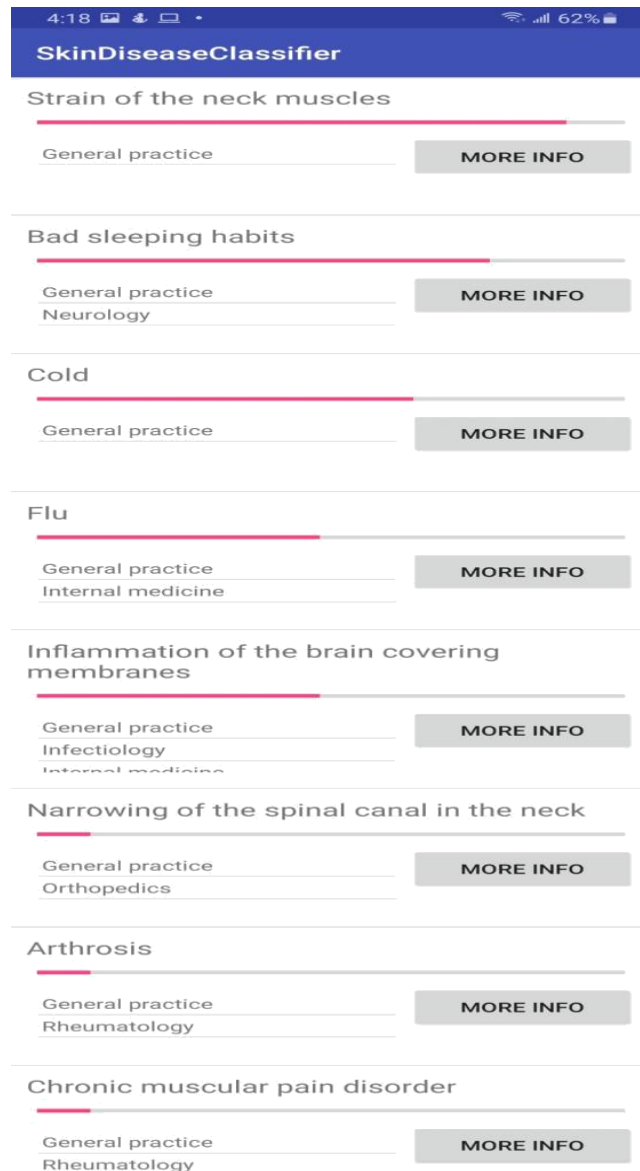

Figure 3.3: Result for common disease prediction

At last, this result is the prediction result generated by our application. These results will depend on following symptoms. If there are several symptoms, the disease prediction is more accurate.
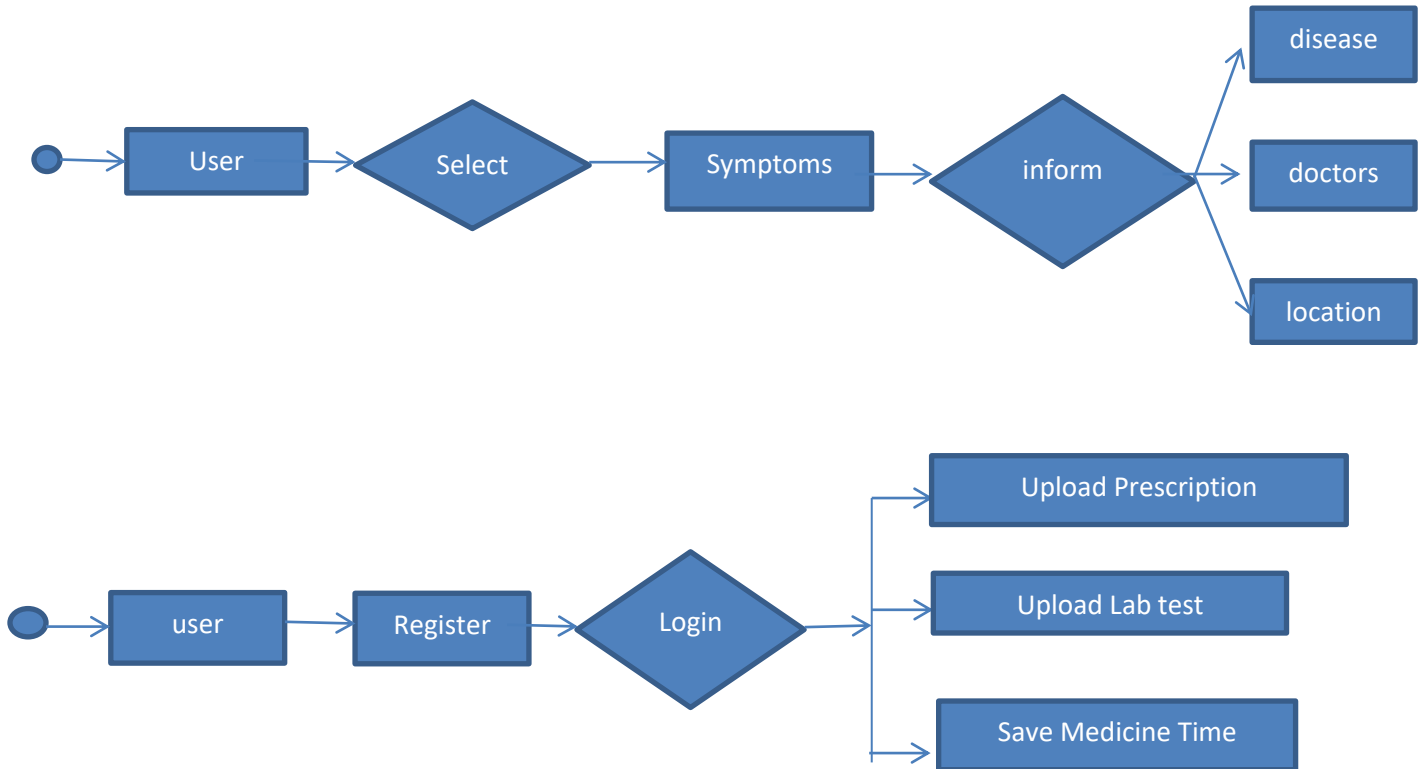
3.5 Flow chart of this system

Fig .3.4: Flow chart for this system
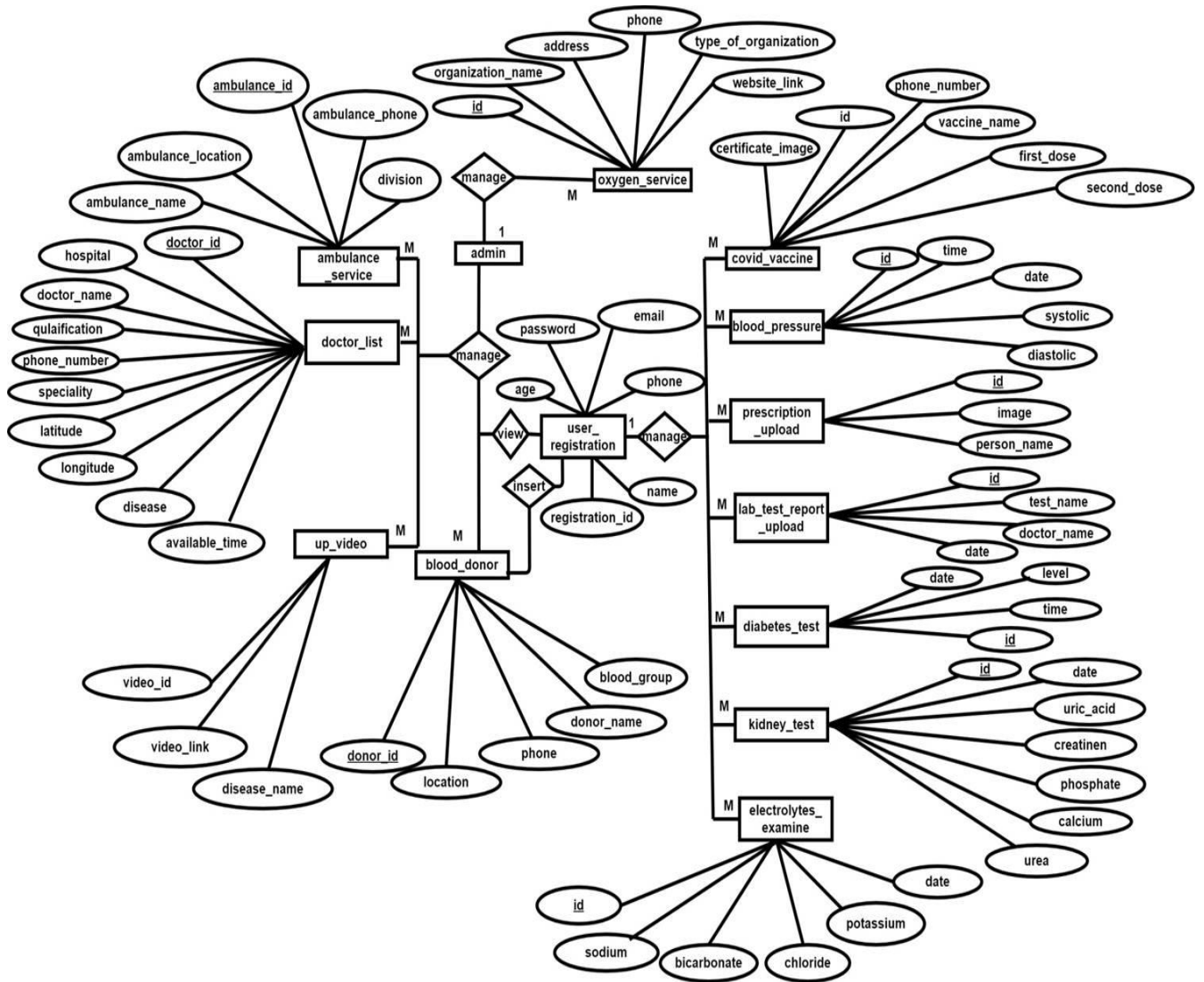
3.6 User Interface:

ER Diagram of this application

Fig 3.5: ER diagram of this application

In this ER Diagram, there are six entities. Which are diseases, prediction, user, prescription, medicine and lab test, etc. The relation between diseases and prediction is a check relation. Because, after checking symptoms people can get the disease predictions.

Then, among user and prescription, medicine relation is inserted relation. Because a user can insert medicine and lab test. Which may use for several times. The single line refers to the relation type is one to one relation.

The oval shapes are referring to attributes of those entities. Those attributes are along with entities. Every entity has a primary key which is indicated by the underline. Those keys cannot be duplicated. So that, those attributes are known as a primary key. Besides, the user id is the foreign key. This is a foreign key because; it is used as a primary key in the user table.
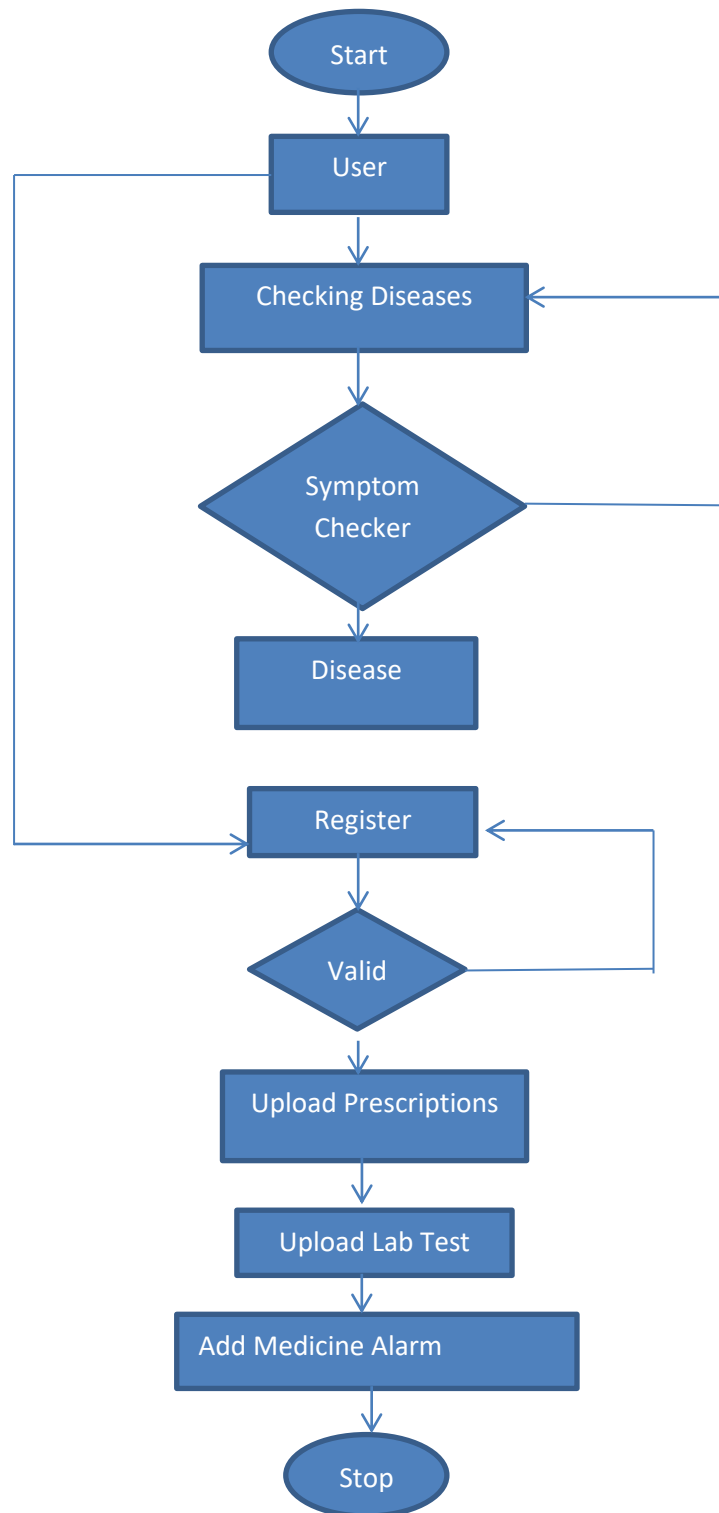
3.7 Flow Chart for User

Fig 3.6: Flow chart of this application

After getting registered user will get his panel. Where they will get their profile. Besides, without registration, they can check their diseases. After registration, they will get their profile. Where people can upload their prescriptions. Besides, they can upload their lab test report. Which can help them to ignore carrying reports and prescriptions always along with them. People will know about their BMI and needed calories. Besides, people can save their diet list.

"A Decision Support System for Symptom Based Common Disease" is an application is making good sense to people about their health, diet, and diseases. By using this application, people will get an idea about their disease by checking their symptoms. People can save their prescriptions and lab test report into this application. People will find out the blood donor and ambulance easily.

➢ Can check disease probability by checking symptoms
➢ Have to Registration first with the required information
➢ Then sign in his profile
➢ Upload Prescriptions
➢ Upload Lab test Report

They can notify about their disease and besides, they will know about the curable process. Besides, patients can be updated with their prescriptions, lab test activities, medicine alarm, blood donor, ambulance, and some very much important features which are related to sound health.

For this reason, they suffer critical disease as usual times. They can't get attachment of doctor for different reasons. They are not able to pay doctor fees; they have no idea who is the best doctor for their diseases. Because they don't know about their diseases. There has no system to know about their disease by checking existing symptoms.
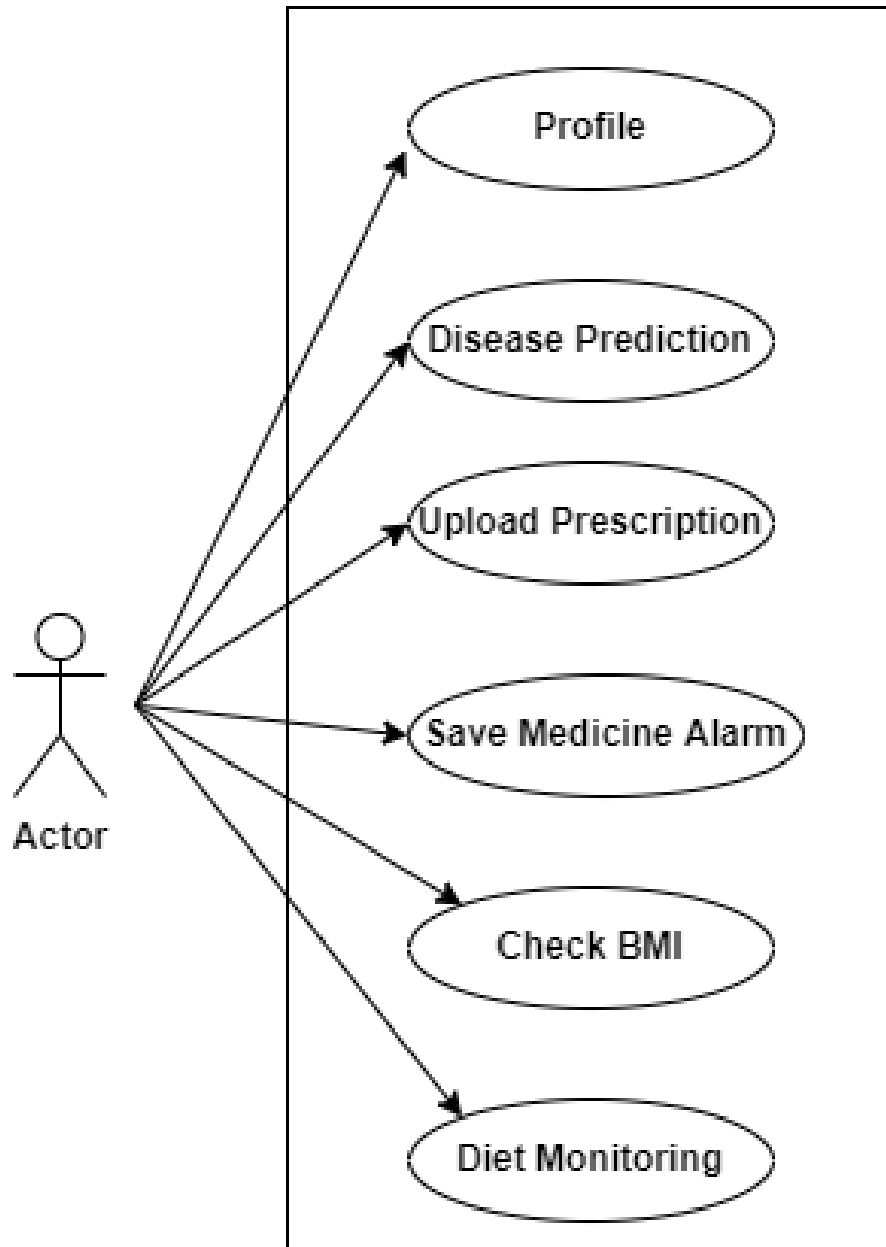
3.8 Use Case Diagram

Fig 3.7: Use case diagram of this application

3.9 Backend

Prediction Methodology

For this task, we have used the SVM (Support Vector Machine) algorithm. There are two types of disease symptoms.

- Common Symptoms
- Uncommon Symptoms

Common symptoms can be fever, cough, runny nose, headache, etc. These symptoms can be seen in several diseases.

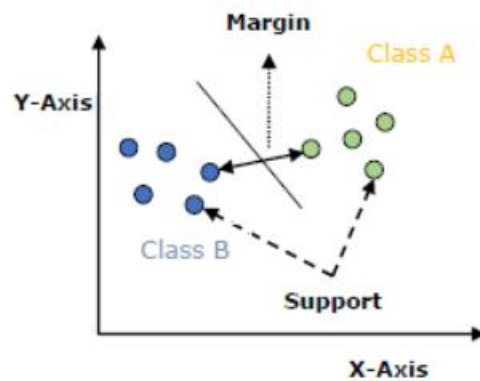Uncommon symptoms can be cold sweats, hair loss, vomiting blood, etc. These symptoms can be seen in certain diseases.

Fig 3.8: Decision boundary

Data Set: For this application process to predict diseases of people, we take the attributes like disease, fever, cough, headache, etc.

Common Diseases

Disease	Fever	Cough	Headache
Flu	100%	60%	30%
Cold	50%	100%	50%
Hay Fever	40%	30%	70%
Cluster Headache	20%	10%	90%
Sleeping Disorder	40%	40%	70%

Data preprocessing: After the collecting of dataset there has another step preprocessing is used to reduce the size of the data, determine the relationships among the data and perform the normalization on data. Following information preprocessing step I can extract the data this is needed for to prediction. [7]

Implementation using Web Scraping

The system of getting data from Rest API is known as Web scraping. By this way data scraping used for extracting data from websites. We have used this process to extract data from a web API for our prediction results. [8]

Common parameters

All requests have 3 common parameters: token, language, and format (optional, the default value is JSON)

Parameter	Type	Values
Token	string	Security token received from https://authservice.priaid.ch/login
Format (optional)	String	JSON, xml

The API we have scraped is http://healthservice.priaid.ch/index.html. We got the JSON format from this API. http://healthservice.priaid.ch/docs.html. By web scraping, those symptoms and diseases are retrieved in this application.

3.10 Software Design:

In general definition, the Process Model is the collection of processes of the same nature that are classified together into a model. The process is a condition that operates and

changes the state of an object. By using the process model activities of a software/app can be shown graphically. To getting a good and beneficial product the process has to be good too. So, we need to process the model because processing is more important than the product. In this case, here waterfall model is used. [9]

The waterfall Model is a consecutive or sequential way where each activity is arranged in linear order and each process is represented in a separate phase. In Waterfall Model, It is a must to plan and schedule all the activities before starting to work on them. Waterfall Model is also known as Linear Sequential Life Cycle.

Phases in Waterfall Model-

- Requirements
- Analysis
- Design
- Implementation
- Testing
- Deployment

- Maintenance
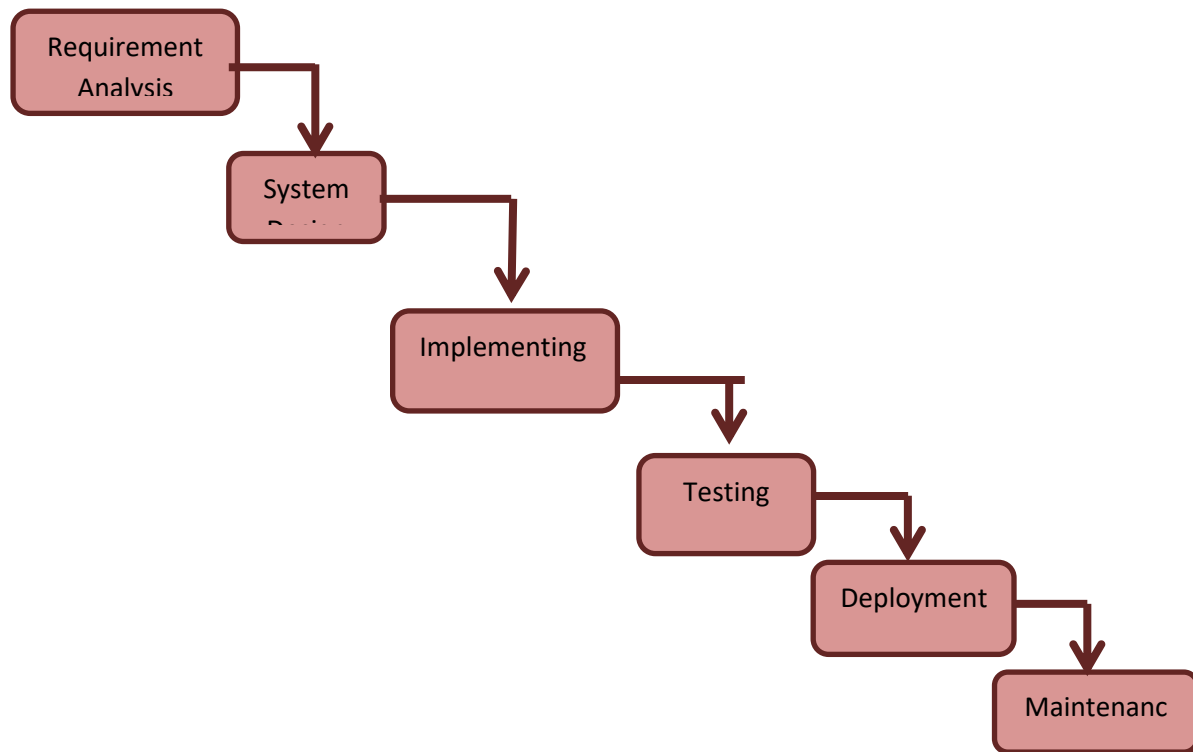
Figure 3.8: Waterfall Model Process

Why Waterfall Model:

We Prefer Waterfall Model, because of its following advantages: -

• This model is better than other models.

• This is cost effective.

• Every step has to implement step by.

• Development processed in sequential manner so very less chance to remodel.

Requirements: First I have to analyze the requirement of the project. If project requirement is not cleared, the other feature cannot be implemented. These requirement analyses help to do the design procedure.

Analysis: After requirement I have to analysis the technology. In this case, I have decided the android operating system for developing projects For predicting diseases after gathering all the symptoms and we have analyzed if the symptoms are valid or not.

Design: After analysis, I have designed the user interface. This user interface is built in XML, CSS, and Bootstrap etc.

Implementing: Then, I started to write coding. All the development works are performed and development components or units handed over to testing team. For vehicle routing problem the implementation is done here. For implementing android application, we have used JAVA and cloud based server Firebase.

Testing: Then the task has finished, testing the system begins or in this way, I tested the application I tested in different phone. Besides, I tested many steps in the application. Then, tested in black box and white box testing

Deployment: After testing, I have deployed is completed and ensures many steps no bug or defect or any quite issue, then thesis is deployed to production. Once product is

deployed to production the top users start using the merchandise. Just in case of auto routing.

Maintenance: After deploying, there has a another step maintenance. Then, For disease prediction application there will a number problem we'll attempt to observe the app continuously and keep the app updated.
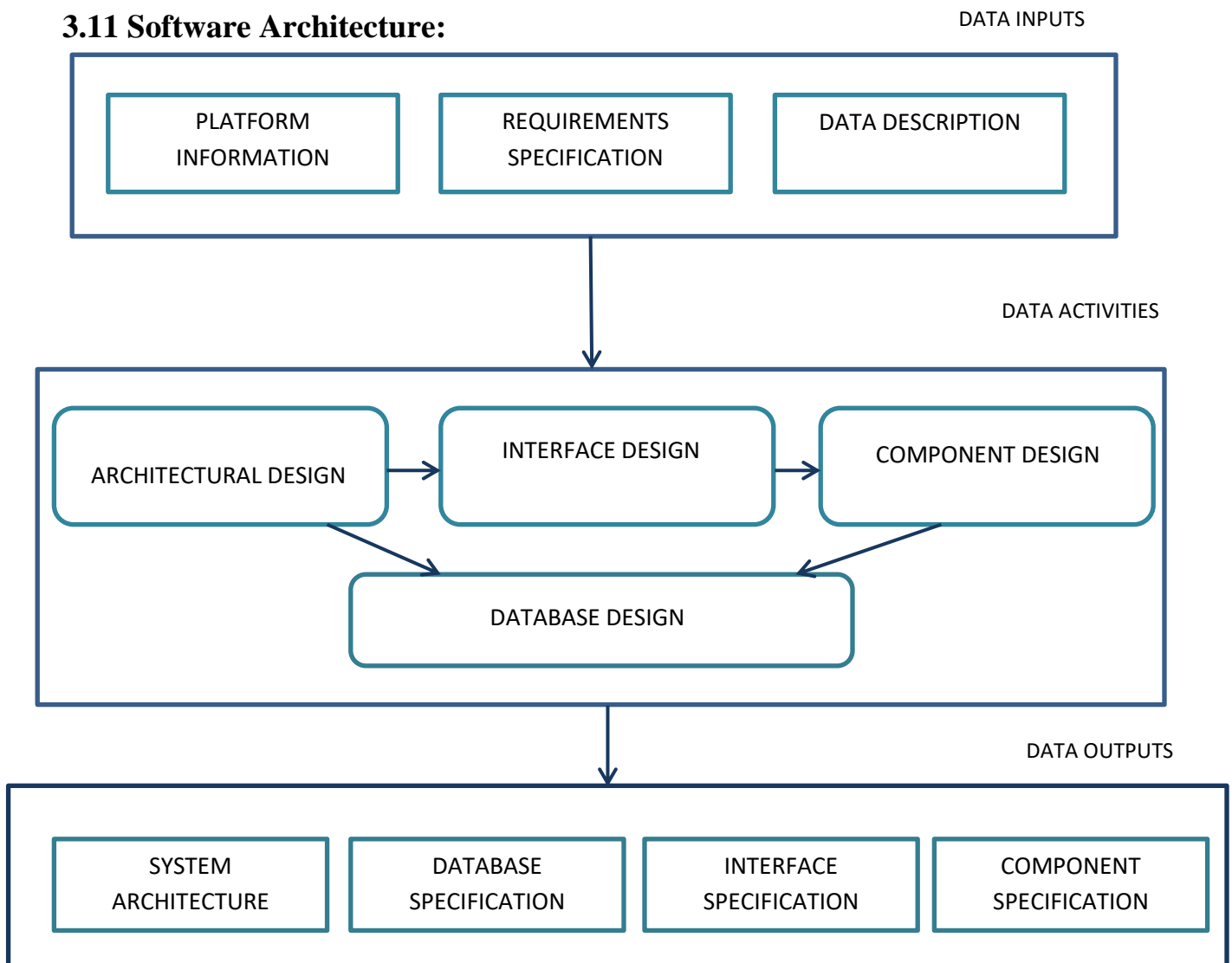
3.11 Software Architecture:

Figure 3.9: Software Architecture

3.12 Required Tools

Hardware Requirements:

- ➤ RAM 4 GB
- ➤ Windows (10,11)
- ➤ Intel i3 Processor

App design tools:

- ➤ Front End: XML
- ➤ Back End: JSON, Java.
- ➤ Cloud Server: MySql Database
- ➤ Code Editor: Android Studio 4.1.1

Web design tools:

- ➤ Front End: HTML,CSS,JAVASCRIPT
- ➤ Back End: PHP

3.13 Technical Details of Android

Android operating system is a popular operating system at present time. So that, we decided to develop this project in android operating system. There are a number of Google facilities help us to do complete our task. Such as- Google Map, Landmark Detection etc. For developing android application, we have used android studio

3.14   XML

Extensible Markup Language (XML) used for the android application frontend. This markup language contains a number of tags. These tags are used for our android application design.

3.15   JAVA

Java used for our android application backend. To make functional all of the options, we have to use JAVA programming language. This language is an object oriented programming language. For this reason, we have followed OOP procedure.

3.16 JSON

JSON stands for Java Script Object Notation. This is a format for uploading data or getting data from our database. For sending data to database, we have formatted data in JSON format. For retrieving data, we formatted data in JSON.

3.17 PHP

In my thesis, PHP is employed to avoid wasting data from the android app and retrieve data from the database. Java can't directly connect with the database. So that, PHP has got to use to complete this task.

3.18 MySQL

  MySQL is our database. We stored data in MySql database. For storing data we used insert query, for getting data we used select query, for updating data we used update query and for deleting data we used delete query.

Chapter 4

Implementation

4.1 Overview

In this chapter, I attached all screenshots and experimental result analysis of my developed system for both web and android applications. I have discussed all steps that an admin and users panel task list.

I tried to represent all of the user data efficiently Disease Prediction System for Common Symptoms APP. 'Disease Prediction System for Common Symptoms' is an application is making good sense to people about their health, diet, and footstep. Which will recommend the required diet list. They can monitor their diet list and they will know how many calories they need daily.

> ➢ Have to Registration first with the required information
> ➢ Then sign in his profile
> ➢ Add Prescriptions
> ➢ Add Lab Test Report

4.2 Android Application

> ➢ For Using this application users have to register or can use it as a guest.
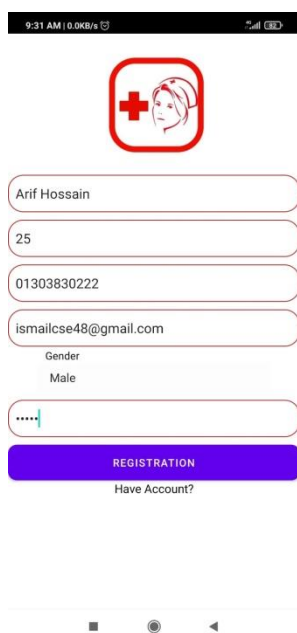
Fig 4.1: User can use this application by registering

Fig 4.2: Login Page

In this Application, people can check their disease by selected symptoms. This will show them the percentages of those diseases.
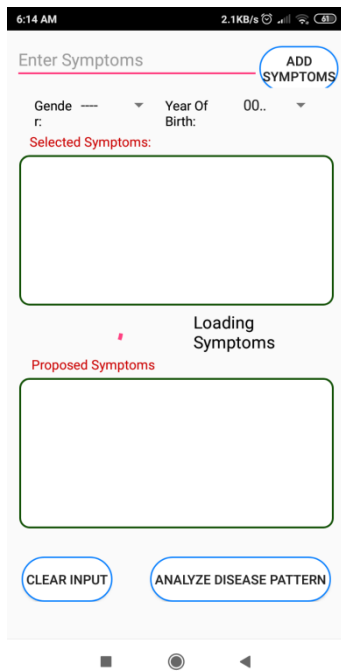
Fig 4.6: Selecting symptoms for predicting diseases
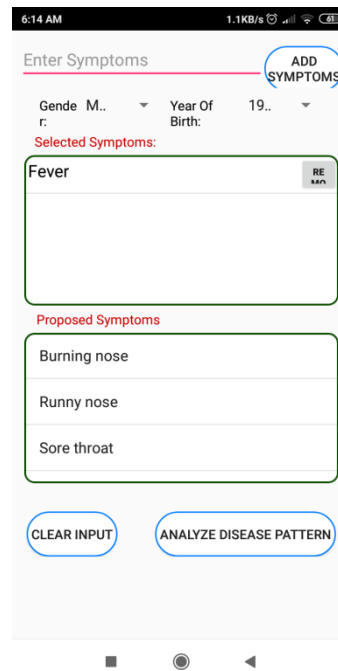
Fig 4.7: Recommending symptoms for written symptom

After selecting symptoms, the application will predict diseases with percentages. The percentage will show by a progress bar.
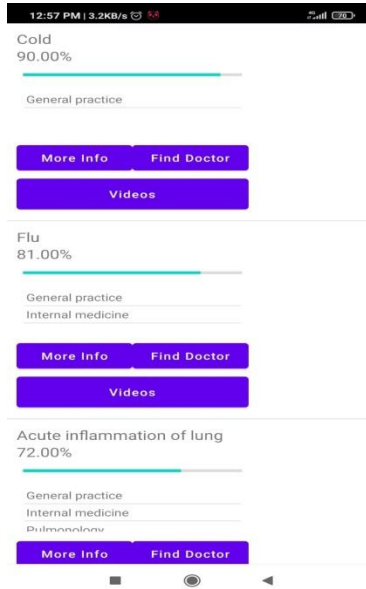
Fig 4.8: Predicting disease with a percentage showing two
options to select

After Predict disease they will get the suggestion to recovery, can search the recommended doctors, make a call to make an appointment, and can find out the doctor's hospital:

Fig 4.9: Suggesting information for a specific disease
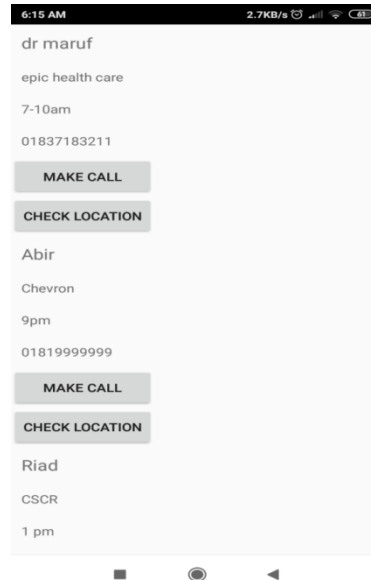
Fig 4.10: Recommended Doctors for better treatment

Fig 4.11: Doctor Location in map
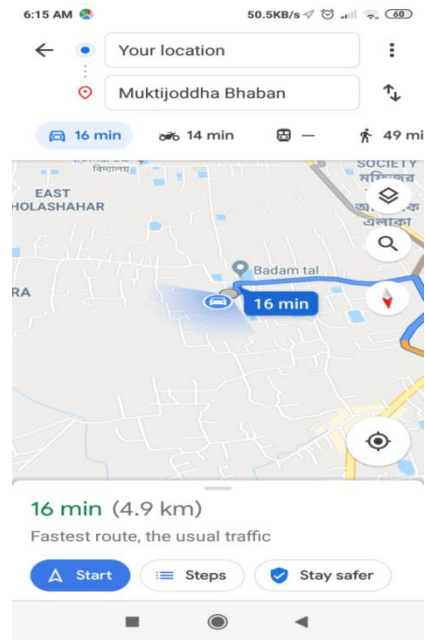
Fig 4.12: Direction in map
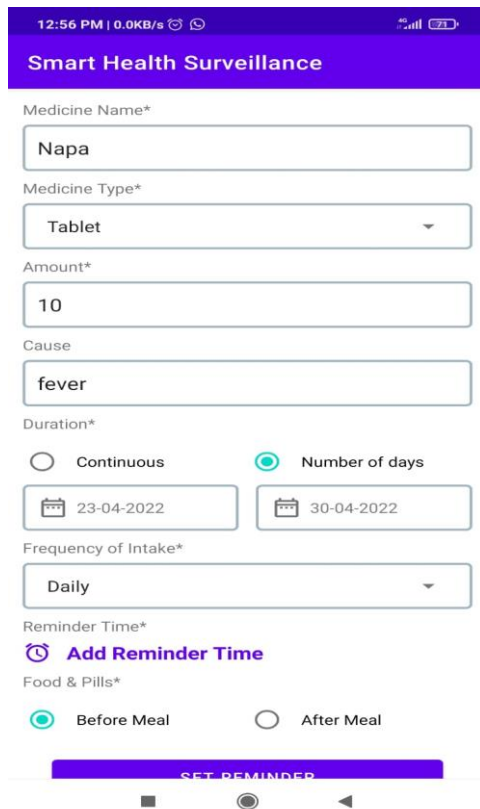
Fig 4.13: Medicine Alarm setting
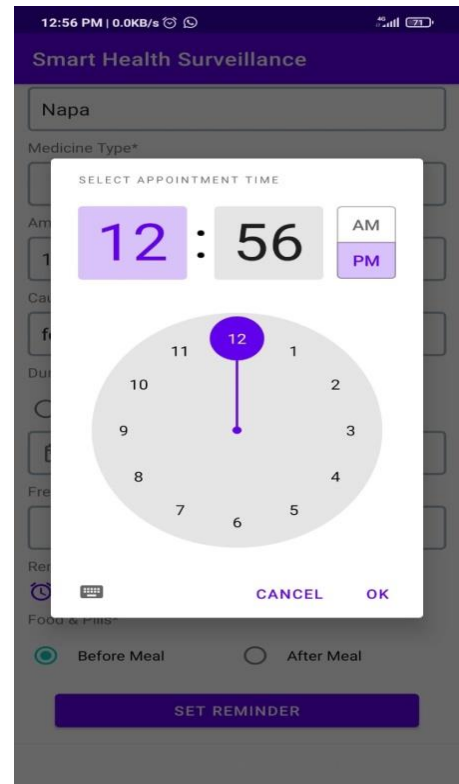
Fig 4.14: Selecting Alarm Time
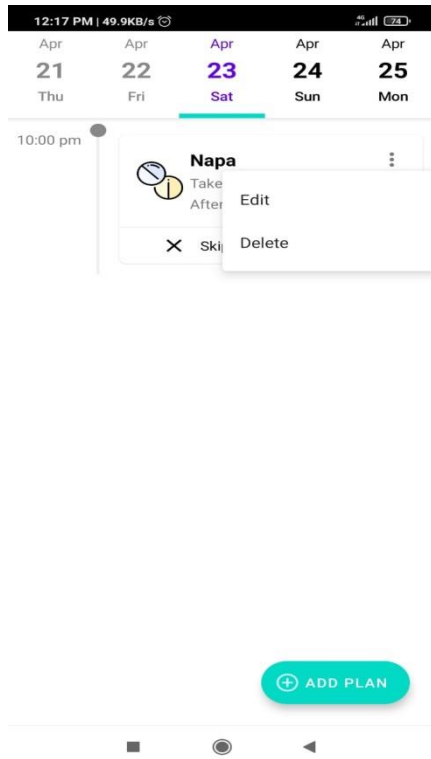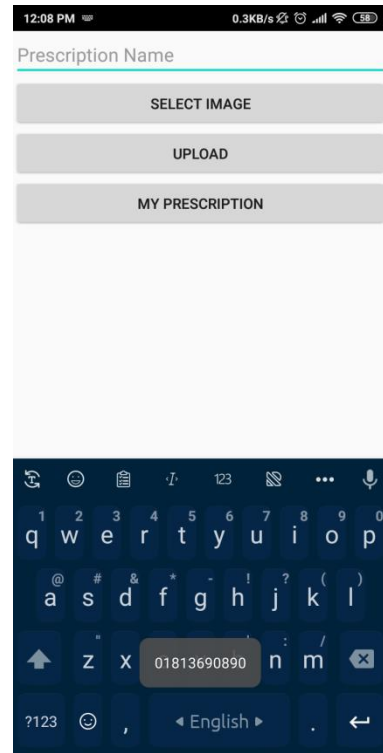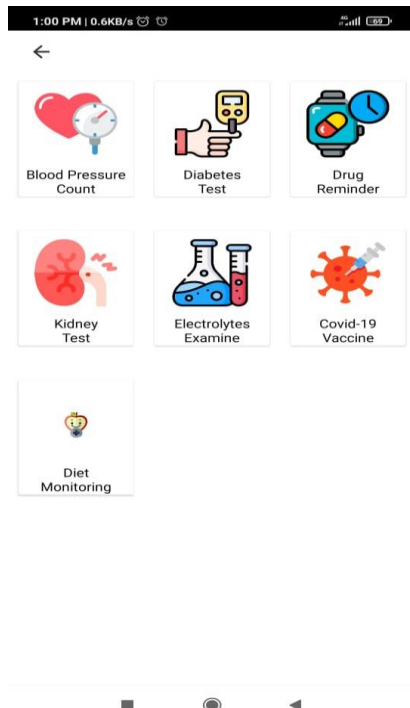
Fig 4.15: Medicine Alarm Lists

Fig 4.16: Upload Prescription

Fig 4.17: Health Record
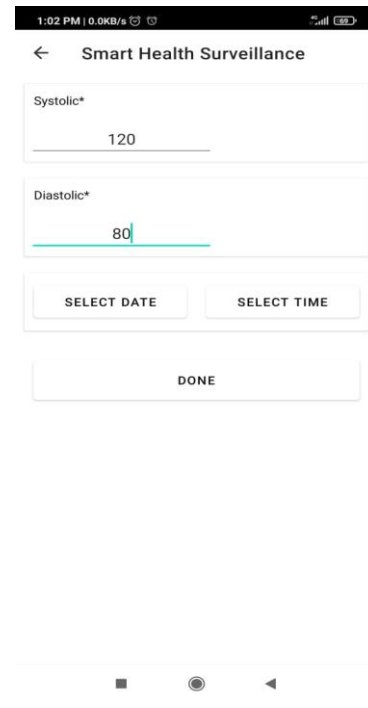
Fig 4.18: Keeping Blood Pressure Record

Your BMI:
470.679
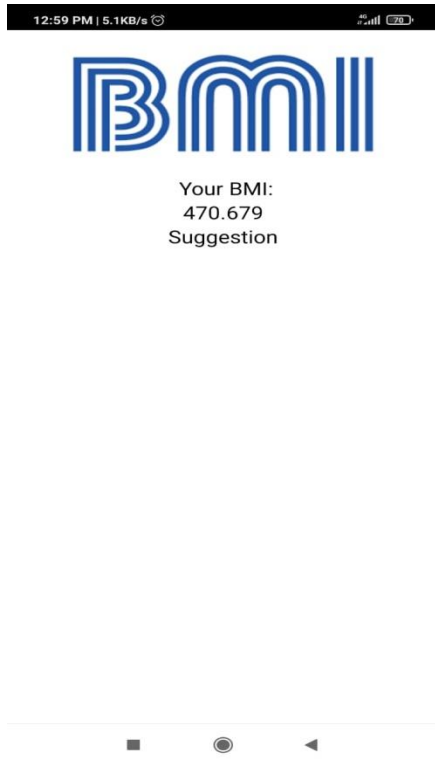Suggestion

36

61

25

CALCULATE

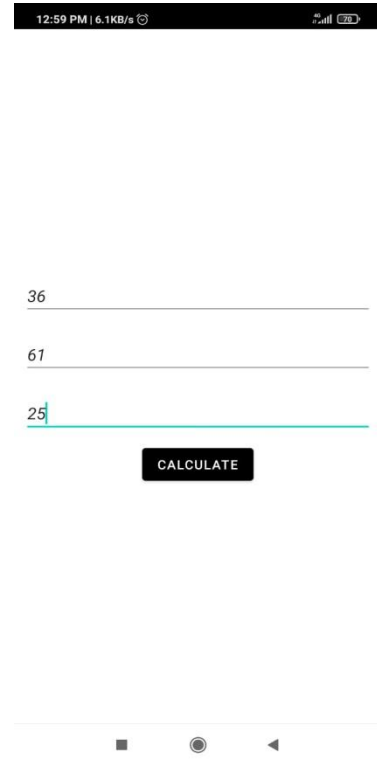Fig 4.19: Measure BMI   Fig 4.20: Calculate BMI

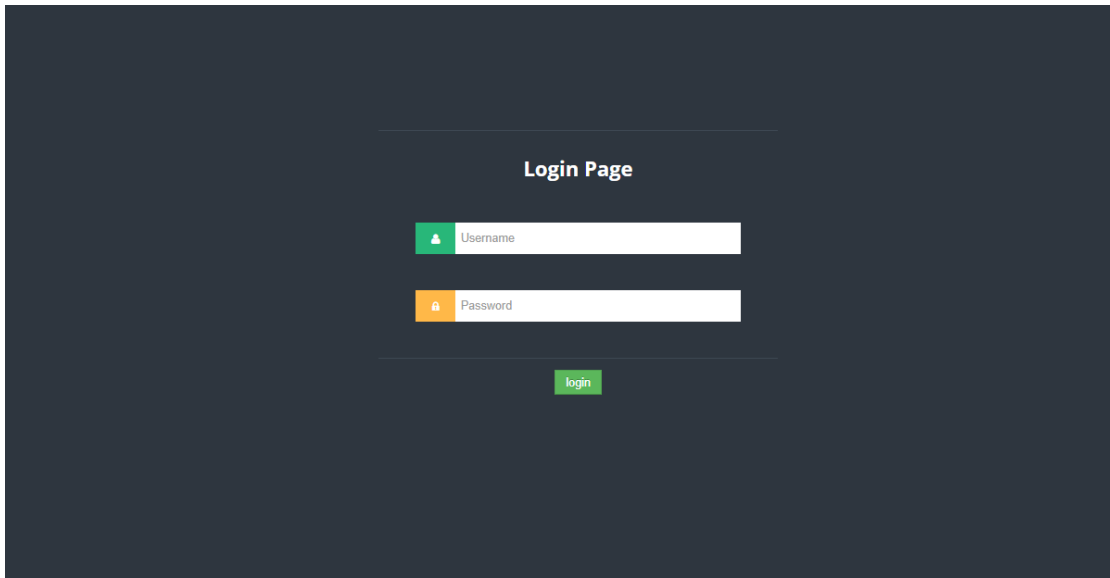Admin Panel for uploading Doctor, Ambulance data:
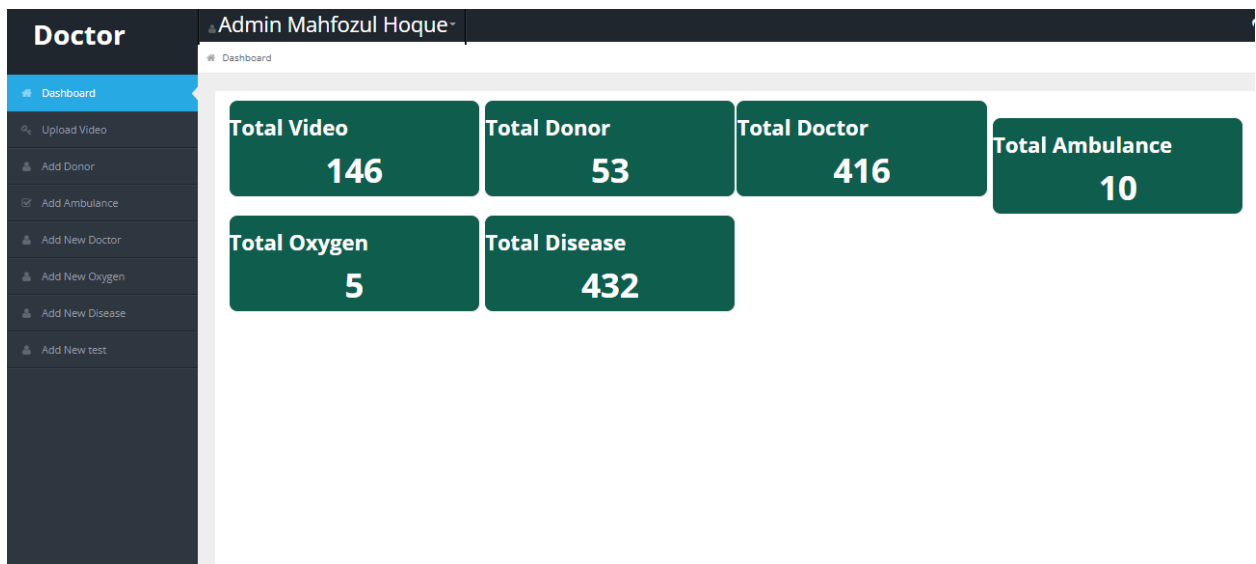

Fig 4.21: Admin Panel

Fig 4.22: Admin Dashboard

Chapter 5

Testing

The Software testing is an investigation conducted to provide the stakeholders with the information about the quality of the product or service under to test. After testing of the software can also provide an objective, independent view of the software to allow the business to appreciate and understand the risks of software implementation.

5.1 Objectives of Testing

There have some different goals and objectives in software testing. The main objectives are as follows:

1. Required the requirements that guided its design and development.

2. Works as expected.

3. Can be implemented with the same characteristics.

4. To prevent defects.

5.2 Types of Testing

The techniques for testing application are given below:

5.2.1 Unit Testing

This is one of the most important testing in software development. By this testing, every particular code, function, has to be tested. These units may be groups of inter connected modules. The purpose of this testing, making every method is functional and fully bug free.

5.2.2 White Box Testing

Internal logic testing of software is known as white box testing. It is also done by the following tests:

- Every statement of coding, have a specific target to fill up. This testing have tested to cover up these targets.
- Decision directions are depending on software life cycle.
- The results of possibilities in a decision are tested for proper working at least once.
- Combination of the possible conditions within a specific decision for all the decisions tasted.

5.2.3 Black Box Testing

- Structural, the requirements and specifications of the system are examined.
- Software tester constructs test cases with the selected inputs.
- The required software tester compares the actual outputs with the expected outputs.
- Defects if any are fixed and re-tested.

5.2.4 Login-

If email and password are not valid then show a toast message that invalid cell or password. If the email and password valid, then user can login.
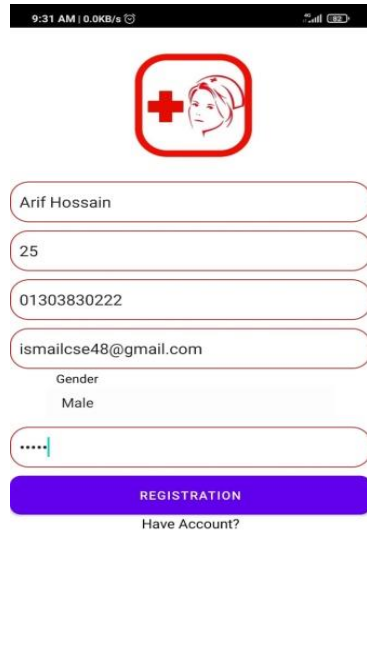

Figure 7.1: Login page

Figure 7.2: Login page

5.2.6 Login validation check table:

If any cell number and password are not current, there is no output. Only valid data is true.

Table 5.1: Validation login

Interface Name	Data Field	Input values	Result
Login	email & Password		Input your email & password
Login	email & Password	jamal@gmail.com	Input your password
Login	email & Password	123456	Input your cell number
Login	email & Password	jamal@gmail.com 123456	Invalid cell or password
Login	Username & Password	jamal@gmail.com 12345	Login successful

Chapter 6

Conclusion

Our Disease Prediction System for Common Symptoms Android Application is a reliable and secure application for the Disease Prediction System for Common Symptoms field. It is complete automation of operations. It is also has a very user-friendly interface requiring minimal learning and IT skills. One of the most satisfactory feedbacks of our system is it saves so much time and energy. It can also reduce manpower and best use of men's power. And also by using this system one can easily have a startup business of their own.

6.1 Limitations

- Can't search manually anything.
- The nearest doctor cannot be detected.

6.2 Future Work

- Doctor online appointment will be implemented.
- Nearest doctor suggestion will be implemented.

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