

SMART HEALTH CONSULTATION

A PROJECT REPORT

submitted by

SAFA (CCV15CS035)

SAIKRISHNA K (CCV15CS037)

BANEE ISHAQUE K (LCCV15CS053)

MUFEEDA THASNI P (CCV15CS026)

To

The APJ Abdul Kalam Technological University

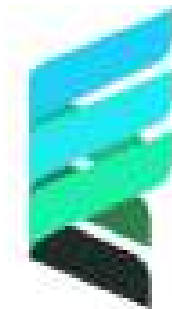
in partial fulfillment of the requirements for the award of the Degree

Of

Bachelor of Technology

In

Computer Science and Engineering



Department of Computer Science and Engineering

Cochin College Of Engineering & Technology

Valanchery

May 2019

DECLARATION

We undersigned hereby declare that the project report “**Smart Health Consultation**”, submitted for partial fulfillment of the requirements for the award of degree of Bachelor of Technology of the APJ Abdul Kalam Technological University, Kerala is a bona fide work done by us under supervision of **Vijesh K.** This submission represents our ideas in our own words and where ideas or words of others have been included; we have adequately and accurately cited and referenced the original sources. We also declare that we have adhered to ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in our submission. We understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not been previously formed the basis for the award of any degree, diploma or similar title of any other University.

Place:

Signature

Date:

Name of the student

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

COCHIN COLLEGE OF ENGINEERING & TECHNOLOGY

VALANCHERY



CERTIFICATE

This is to certify that the report entitled '**Smart Health Consultation**' submitted by '**Banee Ishaque K (LCCV15CS053), Mufeeda Thasni P (CCV15CS026), Saikrishna K (CCV15CS037) & Safa (CCV15CS035)**' to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the Degree of Bachelor of Technology in Computer Science and Engineering is a bona fide record of the project work carried out by them under my guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

Internal Supervisor(s)

External Supervisor(s)

Project Coordinator

Head of the Dept.

CONTENTS

ACKNOWLEDGEMENT	i
ABSTRACT	ii
LIST OF FIGURES	iv
ABBREVIATIONS	v
1 INTRODUCTION	1
1.1 General Background	1
1.2 Project Objective	2
1.3 Project Scope	2
1.4 Organisation of Thesis	3
2 LITERATURE SURVEY	4
2.1 Novel method for disease recognition And cure time prediction based on symptoms	4
2.2 Prediction system for disease using naive Bayes	5
2.3 A semantic feature space for disease prediction	6
2.4 Disease prediction using hybrid K-means & Support Vector Machine	6
3 METHODOLOGY	7
3.1 Search doctor	7
3.2 Online appointment	7
3.3 Collect feedback	7
3.4 System design	7
3.4.1 System architecture design	7
3.5 Methods	10
3.5.1 Search hospital	10
3.5.2 Improvise application	11
3.5.3 SQLite database	11
3.6 Use case diagrams	11
3.6.1 Patient use case diagram	11
3.6.2 Doctor use case diagram	12
3.6.3 Guest use case diagram	12
3.7 Data flow diagrams	13

3.7.1	Patient data flow diagram	13
3.7.2	Doctor data flow diagram	13
3.7.3	Admin data flow diagram	14
3.8	System requirements	14
3.8.1	Hardware requirements	14
3.8.2	Software requirements	14
3.8.3	Development requirements	21
4	RESULTS AND DISCUSSION	25
5	CONCLUSIONAND FUTURE WORK	30
	REFERENCES	31

ACKNOWLEDGEMENT

Every success stands as a testimony not only to the hardship but also to hearts behind it. Likewise, the present project work has been undertaken and completed with direct and indirect help from many people and we would like to acknowledge the same.

First and foremost we take immense pleasure in thanking the Management and respected principal, **Mr. Sakkariya Thodungal**, for providing us with the wider facilities.

We express our sincere thanks to **Ms. Meera K**, Head of Department of Computer Science and Engineering for giving us opportunity to present this project and for timely suggestions.

We wish to express our deep sense of gratitude to the project coordinator **Mr. Vijesh K**, Asst. professor, Department of Computer Science and Engineering, who coordinated us in right path. Words are inadequate for offering our sincere thanks to Guide, **Ms. Nikhitha C** Asst. professor Department of Computer Science and Engineering, for her encouragement and guidance in carrying out the project

Needless to mention that the teaching and the non-teaching faculty members had been the source of inspiration and timely support in the conduct of our project. We would like to express our heartfelt thanks to our beloved parents for their blessings, our classmates for their help and wishes for the successful completion of this project.

Above all we would like to thank the Almighty God for the blessings that helped us to complete the venture smoothly.

ABSTRACT

Nowadays consulting a doctor is a tiresome task, we need to find the respective doctor, book appointments and wait for consultation. This is more hectic in the case of emergencies especially when the patient is in an unknown area, finding a doctor is not easy. The patient's appointment may be cancelled when doctor's schedule is changed. In this case, time consumption in emergencies may cause harm to the patient. As a solution to this problem, we introduce a fast and easy to access Smart health consulting system. The smart health consulting system aims at maintaining patient health records and getting appointments from various doctors of related treatments.

The system user must register as a member of this system and keep updating his/her medical history (by own as well as referring doctor). System predicts a doctor or a list of doctors specialized for respective treatments such as (skin specialist, ENT specialist, cardiologist etc.) at particular locations. The available schedules and timings of selected doctor is shown, where the patient can choose appropriate appointments. This project consists of a general user area, doctor's area and a patient's area. The general user area provided with help system, video tutorials and testimonials.

The doctor's area consists of daily schedules (details of appointments per day) and leave management. Patient's area consists of medical data management, registration for treatment and billing. Consulting a doctor is an obvious thing in our day-to-day life, but the availability of the doctor during the time of our requirement is unpredictable. In order to overcome the issue a proposal of android application is made, this smart health application enables users to get instant report on their health issues through an intelligent health care application online.

This E-health application enables user to express their symptoms and issues. It then processes user's issues and symptoms to check for various health issues that could be associated with the symptoms given by the user. If the application is unable to provide a particular solution then it urges the user to under-go tests like blood test, CITI scan accordingly.

Data mining is the computer-based process of analyzing enormous sets of data and then extracting the meaning of the data. Data mining tools can answer business questions that traditionally taken much time consuming to resolve. The huge amounts of data generated for prediction of disease are too complex and voluminous to be processed and analyzed by traditional methods. Data mining provides the methodology and technology to transform these mounds of data into useful information for decision-making.

By using data mining techniques it takes less time for the prediction of the disease with more accuracy. We survey different papers in which one or more algorithms of data mining used for the prediction of disease. Result from using neural networks is nearly 100% in one paper. So that the prediction by using data mining algorithm given efficient results. These large amounts of data are very important in the field of Data Mining to extract useful information and generate relationships amongst the attributes.

The doctors and experts available are not in proportion with the population. In addition, neglect symptoms often. Disease diagnosis is a complex task, which requires much experience, and knowledge. In the health care industry, the data mining is mainly used for predicting the diseases from the datasets.

Keywords: Smart health, Android application, E-health, Intelligent health care application, Naive Bayes algorithm.

LIST OF FIGURES

No	Title	Page No
3.1	Patient's Perspective	8
3.2	Admin Perspective	9
3.3	Doctor's Perspective	10
3.4	Patient UCD	11
3.5	Doctor UCD	12
3.6	Guest UCD	12
3.7	Patient DFD	13
3.8	Doctor DFD	13
3.9	Admin DFD	14
3.10	Android KitKat Logo	15
3.11	Android KitKat UI	16
3.12	Python Logo	17
3.13	Android Studio UI	21
3.14	PyCharm UI	22
3.15	phpMyAdmin UI	23
3.16	MySQL Workbench UI	24
4.1	Server Configuration	25
4.2	Launch Screen	25
4.3	Add Your Symptoms	26
4.4	Prediction Results	26
4.5	Appointment Process	27
4.6	Payment Process	28
4.7	Receipt Generation Process	29

ABBREVIATIONS

DFD	Data Flow Diagram
GUI	Graphical User Interface
IDE	Integrated Development Environment
NLP	Natural language processing
RDBMS	Relational Database Management System
SVM	Support Vector Machine
WYSIWYG	What You See Is What You Get

CHAPTER 1

INTRODUCTION

1.1 General Background

The use of computer systems in decision-making, prediction and recommendation has been a trending topic of research for more than a decade. The recent advances in medical science can be attributed to advances in computer technology. However, the prediction of medical behaviour is still a very challenging task, which is done with the help of a medical professional. The occurrence of every disease shows a pattern based on its symptoms. The focus of this project is to propose a system to exploit these patterns for predicting the associated diseases and facilitating doctors for their treatment. The core idea behind this was that every symptom of a disease has a unique impact on severity. By prediction we mean to forecast an occurrence of a condition based on some mathematical calculation. For implementing this prediction, we need a recommender system. A recommender system is a system, which reads an input, finds a pattern in it, which is based on the dataset given to train the system. Based on the pattern it figures out a solution for the problem.

A naive solution can be to create a database of every possible disease and its symptoms and predicting diseases based on that. The biggest drawback about this solution is that the efficiency and speed of this solution are very less and the size of this dataset would be very large. The solution that we suggest is, of using the symptoms with the ratings given by the patient, to predict the possible diseases. The main objective of this project is to develop an Intelligent System using data mining modelling technique, namely, Naive Bayes. It is implemented as web based application in this user can enter the disease symptoms and update the past medical history if any. It retrieves hidden data from stored database and compares the user values with trained data set. It can answer complex queries for diagnosing disease and thus assist patients to make intelligent clinical decisions, which traditional decision support systems cannot. By providing effective treatments with authorised doctors, it also helps to reduce treatment costs.

1.2 Project Objective

The doctor's area consists of daily schedules (details of appointments per day) and leave management. Patient's area consists of medical data management, registration for treatment and billing. Consulting a doctor is an obvious thing in our day-to-day life, but the availability of the doctor during the time of our requirement is unpredictable. In order to overcome the issue a proposal of android application is made, this smart health application enables users to get instant report on their health issues through an intelligent health care application online. This E-health application enables user to express their symptoms and issues. It then processes user's issues and symptoms to check for various health issues that could be associated with the symptoms given by the user. If the application is unable to provide a particular solution then it urges the user to consult a general physician. Data mining is the computer-based process of analyzing enormous sets of data and then extracting the meaning of the data. Data mining tools can answer business questions that traditionally taken much time consuming to resolve. The huge amounts of data generated for prediction of disease are too complex and voluminous to be processed and analyzed by traditional method.

1.3 Project Scope

Here the scope of the project is that integration of clinical appointments support with computer-based patient records could reduce time consumption, patient's risk, enhance patient safety, decrease unwanted practice variation, and improve patient outcome. This suggestion is promising as data modeling and analysis tools, e.g., data mining, have the potential to generate a knowledge-rich environment, which can help to significantly improve the quality of clinical choices .The System is developed using Decision tree technique. The system extracts hidden knowledge from a disease database. This is the most effective model to predict disease of patients according to the provided symptoms. This model develop a prototype Disease Prediction System using data mining modeling techniques, namely, Decision tree induction technique. So it provides effective treatments, it also helps to reduce treatment costs and enhances visualization and ease of interpretation with immense knowledge and accurate data in that field. Large corporations invest heavily in this kind of activity to help focus attention on possible events and risks that are involved. Such work brings together all available past and current data, as based on which to develop reasonable expectations about the future.

1.4 Organisation of Thesis

The report is organized as 5 chapters. All the chapters have been continuously numbered for easy identification. Chapter 1 is the introduction to the project following the general background, objectives and project scope. Chapter 2 deals with the literature survey where four surveys are included. Third chapter deals with the design methods that are methodologies. It includes the system development requirements. Chapter 4 is the results and discussions. It deals with the results of our project and their screenshots. The final chapter concludes the project and deal with the future work.

CHAPTER 2

LITERATURE SURVEY

2.1 A novel method for disease recognition based on symptoms [4]

Healthcare is a sector where decisions usually have very high-risk and high-cost associated with them. One bad choice can cost a person's life. With diseases like Swine Flu on the rise, which have symptoms quite similar to common cold, it is very difficult for people to differentiate between medical conditions. Here propose a novel method for recognition of diseases and prediction of their cure time based on the symptoms. We do this by assigning different coefficients to each symptom of a disease, and filtering the dataset with the severity score assigned to each symptom by the user. The diseases are identified based on a numerical value calculated in the fashion mentioned above. For predicting the cure time of a disease, we use reinforcement learning.

The algorithm takes into account the similarity between the condition of the current user and other users who have suffered from the same disease, and uses the similarity scores as weights in prediction of cure time. We also predict the current medical condition of user relative to people who have suffered from same disease by prediction we mean to forecast an occurrence of condition based on some mathematical calculation. For implementing this prediction, we need a recommender system. A recommender system is a system, which reads an input, finds a pattern in it, which is based on the dataset given to train the system. Based on the pattern it figures out a solution for the problem.

A naive solution can be used to create a database of every possible disease and its symptoms and predicting diseases based on that. The biggest drawback about this solution is that the efficiency and speed of this solution are very less and the size of this dataset would be very large. The solution that we suggest is, of using the symptoms with the ratings given by the patient, to predict the possible diseases and the possible cure time of these diseases.

Our solution is novel and better because we predict the diseases based on the severity of the patients symptoms and the cure time prediction is based on real-life data given by other patients. For an accurate prediction, we give different coefficients to all the symptoms possible for a disease.

2.2 Prediction system for disease using naive Bayes [1]

In this fast moving world people want to live a very luxurious life so they work like a machine in order to earn lot of money and live a comfortable life therefore in this race they forget to take care of themselves, because of this their food habits change, their entire lifestyle change, in this type of lifestyle they are more tensed they have blood pressure, sugar at a very young age and they don't give enough rest for themselves and eat what they get and they even don't bother about the quality of the food if sick then go for their own medication as a result of all these small negligence it leads to a major threat that is the heart disease. It is a world known fact that heart is the most essential organ in human body if that organ gets affected then it also affects the other vital parts of the body. Therefore, it is very important for people to go for a heart disease diagnosis. Because of this, people go to healthcare practitioners but the prediction made by them is not 100% accurate.

Quality service implies diagnosing patients correctly and administering treatments are effective. Poor clinical decisions can lead to disastrous consequences, which are therefore unacceptable. Hospitals must also minimize the cost of clinical tests. They can achieve these results by employing appropriate computer-based information and/or decision support systems. The healthcare industry collects huge amounts of healthcare data, which, unfortunately, are not "mined" to discover hidden information for effective decision-making. Discovery of hidden patterns and relationships often goes unexploited. Advanced data mining techniques can help as a remedy for this situation. This research has developed a prototype Heart Disease Prediction System (HDPS) using data mining techniques, namely, Decision Trees, Naïve Bayes and Neural Network. Results show that each technique has its unique strength in realizing the objectives of the defined mining goals.

2.3 A semantic feature space for disease prediction [2]

The huge amount of data generated by modern medicine has motivated us to develop decision support systems for improving health care applications. Here, we address the problem of clinical disease prediction given patient-reported symptoms and medical signs where patient records lack of semantic code annotation. We propose a novel context-enhanced disease prediction approach based on leveraging semantic and contextual medical entity relations. We have already exploited semantic relations of medical terminology for patient records search but they were never considered for disease prediction in the literature. Patient signs and symptoms are first mapped to SNOMED-CT concepts, which compose a feature space for disease prediction. Our major contributions in here consist of expanding the feature space using semantic and contextual concept relations of SNOMED-CT. Based on patient's reported signs and symptoms, we use biomedical text mining tool, namely Metamap to extract concepts of the SNOMED-CT metathesaurus. A "concept" in SNOMED-CT is a clinical meaning identified by a unique numeric identifier (ConceptId) and described via a set of words. For each concept, we define a medical entity context by integrating "defining" and "qualitative" medical aspects through the use of different types of semantic and contextual relationships of SNOMEDCT.

2.4 Disease prediction using hybrid K-means & Support Vector Machine [3]

Medical data mining is one of the significant research fields as medical organizations produce large volume of data on daily basis. Handling this vast amount of data in medical field is challenging, so there is a need to mine this data in order to extract useful patterns for disease prediction. A hybrid K-means and Support Vector Machine algorithm for disease prediction is proposed here. The proposed hybrid K-means algorithm is helpful in choosing initial centroids, number of clusters and also to improve the efficiency of K-means algorithm. The hybrid K-means algorithm is used for dimensionality reduction of the dataset which is given as an input to Support Vector Machine classifier. The simulation is performed in MATLAB and from the results it has been analyzed that the accuracy of the classification is improved and the processing time to obtain the final output is reduced.

CHAPTER 3

METHODOLOGY

3.1 Search Doctor

This application enables the user to search for the doctors available depending upon the requirement i.e. the symptoms/disease the patient has. Various doctors for various specializations related to important parts of the body like heart, kidney, brain, liver etc. could be found on this application with the doctor's availability, contact details.

3.2 Online Appointment

After undergoing the registration & login procedures, the user can find the required doctor with his scheduled timings, contact details the user can get an appointment from the doctor easily by this application.

3.3 Collect Feedback

Every user of the application can provide certain feedback of the doctor/application after logging in this helps to continuously monitor and improve the efficiency of the application and it can satisfy every user depending upon the requirements. Admin can check the feedbacks provided by the user and act accordingly.

3.4 System Design

3.4.1 System Architecture Design

In this project, it is discussed majorly about the requirements, architecture, and usage of the proposed android mobile application. The patients, doctors, use the application and the admin so the system can be viewed in three perspectives from various users (patients, doctors and the admin) the system architectures are depicted below.

3.4.1.1 Patient's Perspective

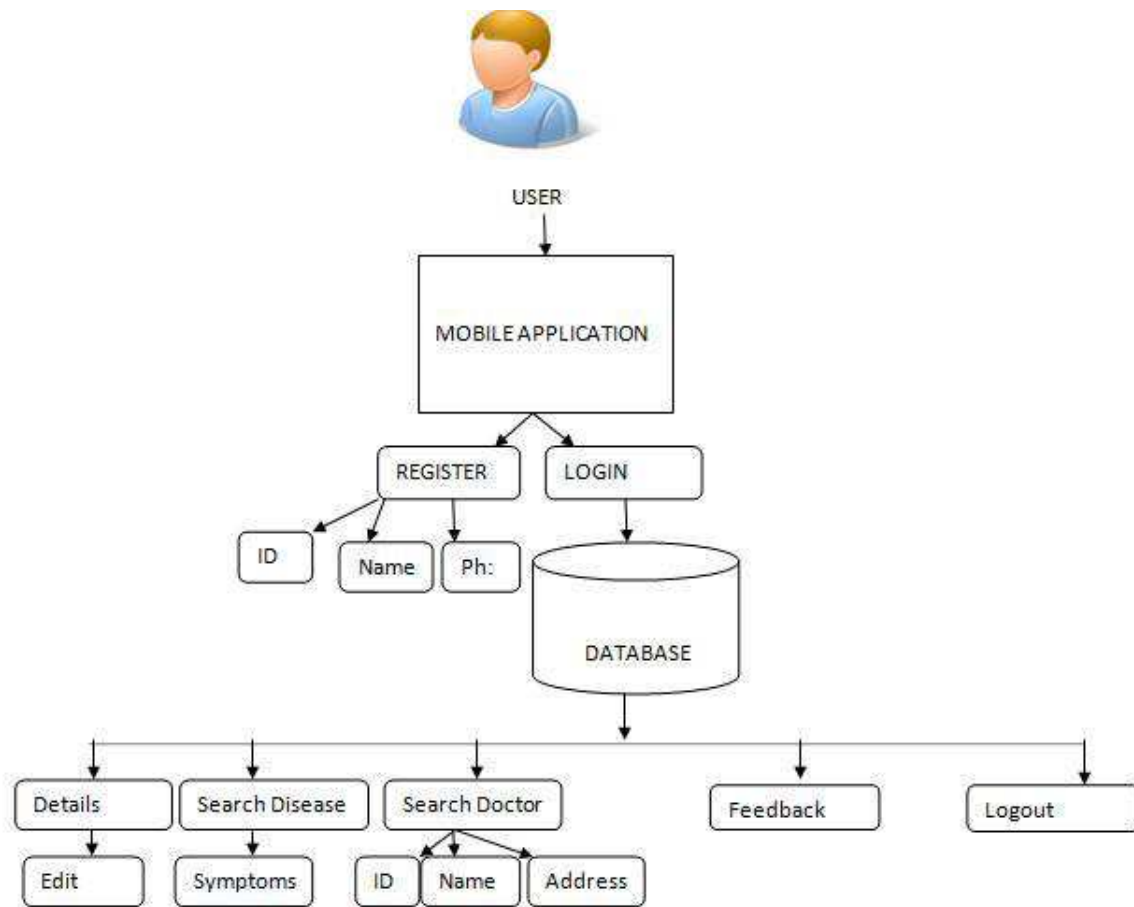


Fig 3.1 Patient's Perspective

The user can access or use the various features integrated by installing the android application into the mobile, the home page of the application consists of the register and login options, where the new user needs to register by providing few details like name, phone number, e-mail id. In addition, a registered user will be directed to the options page where various options like his/her details which can be edited, Diseases can be searched with the symptoms seen, doctor's ID or name or address can search various doctors. A user can give feedback after the usage and logging out from this page directs to the home page i.e. the page, which is seen immediately after opening the application.

3.4.1.2 Admin Perspective

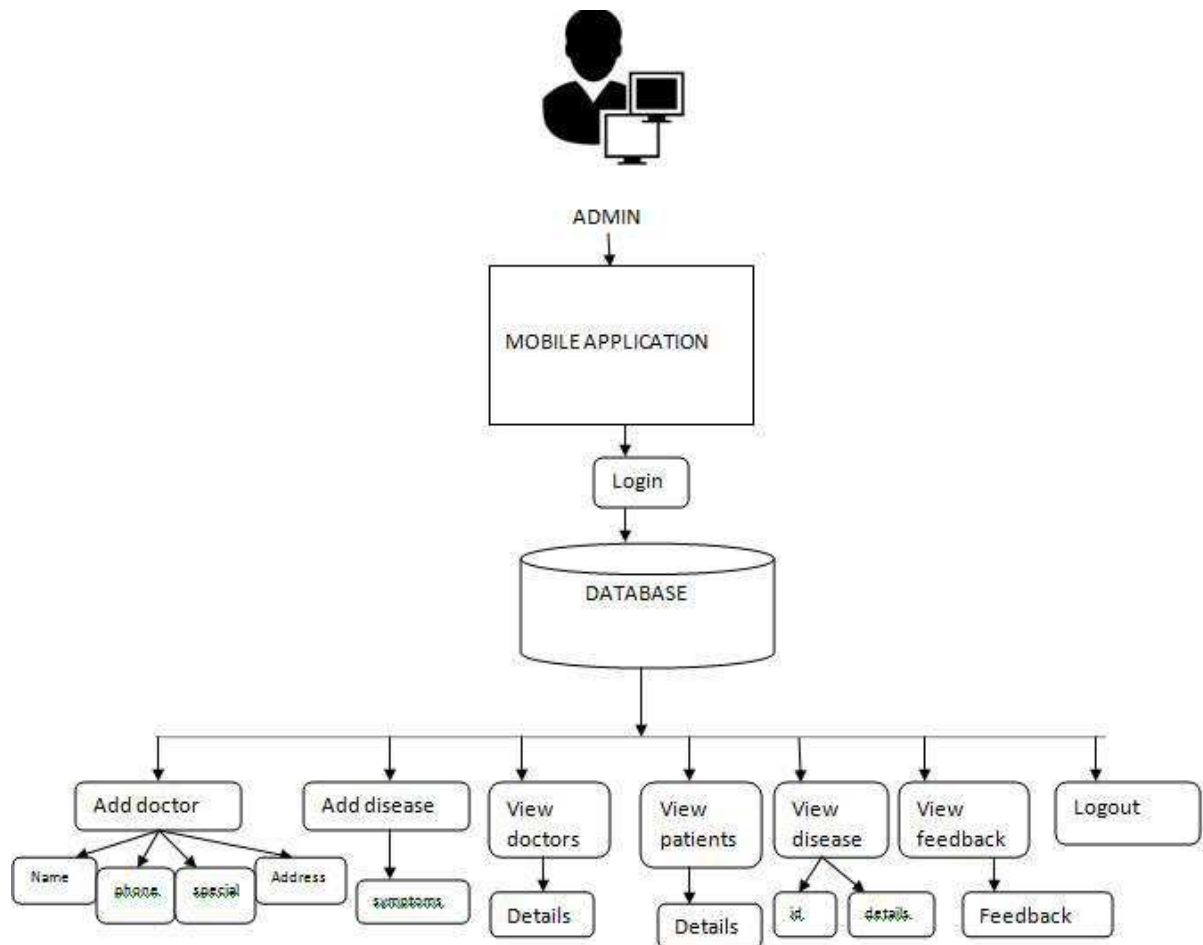


Fig 3.2 Admin Perspective

An admin is the one who coordinates both the users and the doctors by providing necessary details for both of them. Admin can add the doctors to the application depending on the requirement and the feedback sent by the users, Admin is the only one who can add doctors to the application. The details of ID, name, phone number and address of the doctor must be entered while adding a doctor into the application. Further modules of the application are view various doctors, patients, diseases given in the form of symptoms by the user, a disease can be added into the application to that enables the user to find out the doctors specialized to treat that disease, Admin can check the details by using view feedback module in the application.

3.4.1.3. Doctor's Perspective

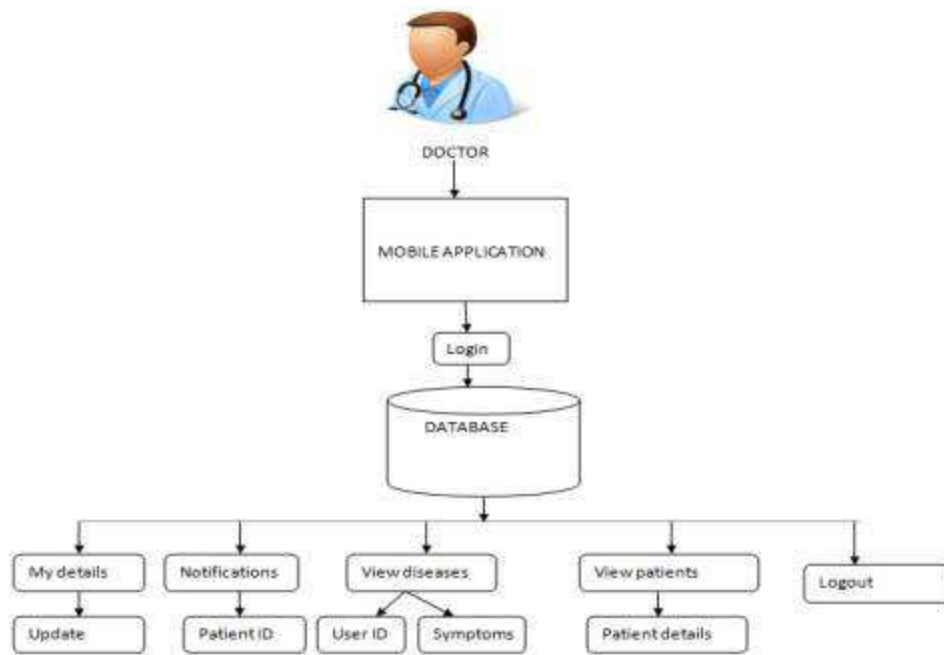


Fig 3.3 Doctor's Perspective

Another user of the application is a doctor. A doctor module consists of doctors details, which can be updated by the doctor in case any contact info/address of the doctor is changed. Notifications enable the doctor to check the id of the patients who need a doctor's help. View disease module enables the doctor to view the patient ID and the symptoms provided by the user, View patient module enable doctor to view various patient's details who have used the application including their details like ID, name, contact details etc. using the application.

3.5 Methods

3.5.1 Search Hospital

In this paper we mainly focus on the how to find the doctors who are specialized to treat a particular disease that too in a shorter span. The doctors who are added to the application can be viewed by various patients including their contact information, availability of the doctor etc. this whole searching process is said to be carried out by the data which has been stored earlier by the admin which can be also be updated at any desired time.

3.5.2 Improve Application

The feedback module, which is provided to the user or the patients, enables to gather various feedbacks given by vivid users of the application. Both the doctors and the admin can view this module. The doctors can improve their services. Whereas, an admin can further more add doctors as per the requirement of the users (patients).

3.5.3 SQLite Database

SQLite database is a Relational database management system (RDBMS) which is used to both add and retrieve the data from the database or the stored location (In our proposed application SD card acts as the storage location), SQLite database can be used both as both web and android application.

3.6 Use Case Diagrams

3.6.1 Patient Use Case Diagram

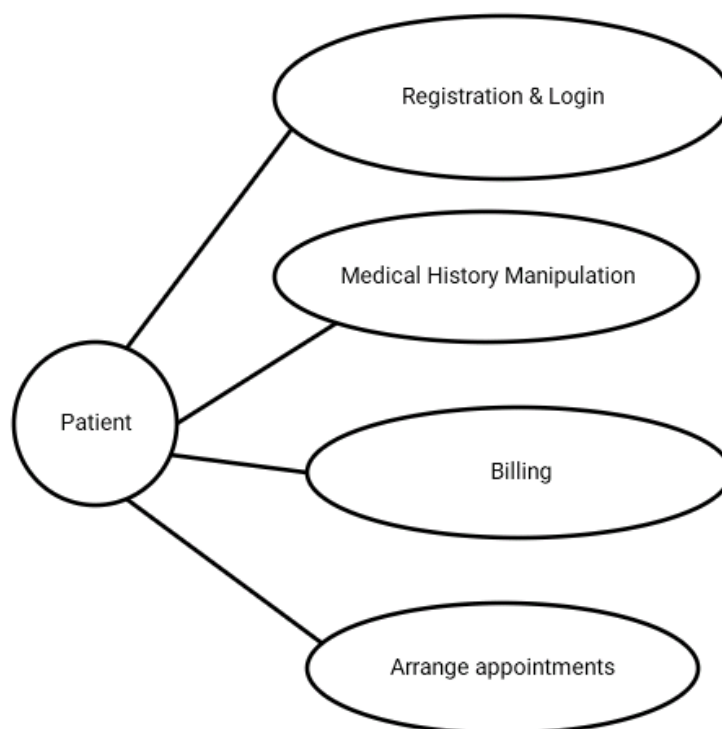


Fig 3.4 Patient UCD

3.6.2 Doctor Use Case Diagram

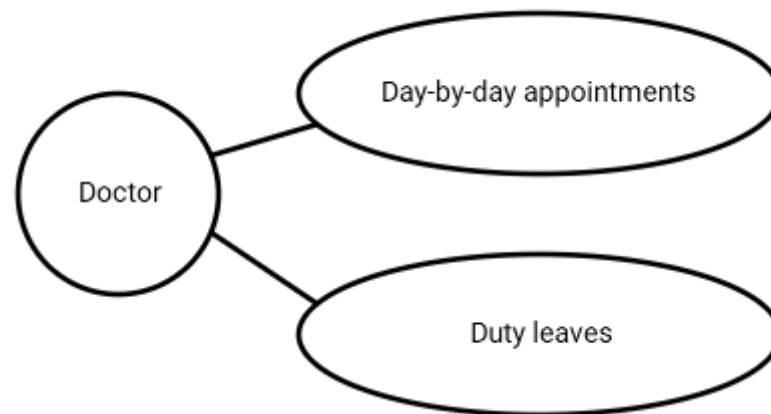


Fig 3.5 Doctor UCD

3.6.3 Guest Use Case Diagram

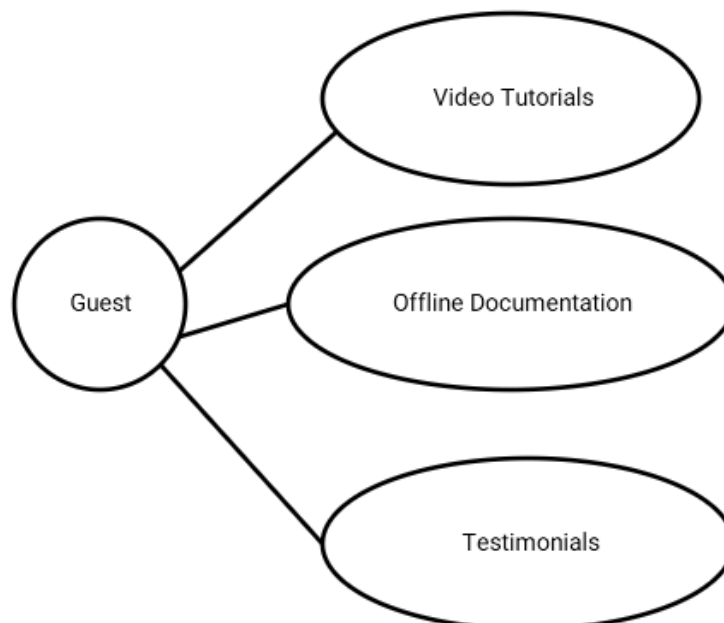


Fig 3.6 Guest UCD

3.7 Data Flow Diagrams

3.7.1 Patient Data Flow Diagram

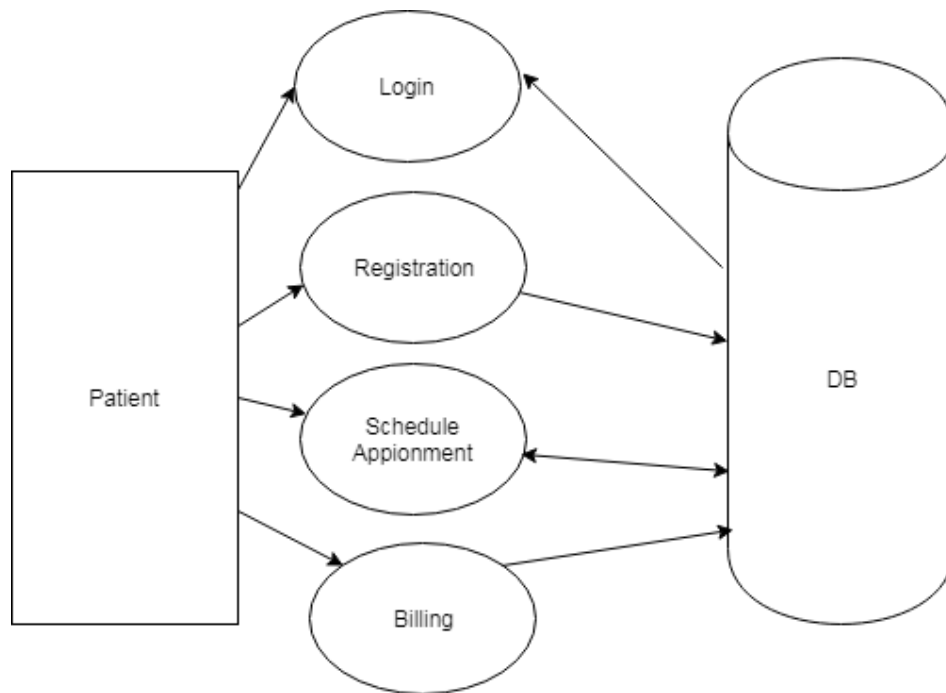


Fig 3.7 Patient DFD

3.7.2 Doctor Data Flow Diagram

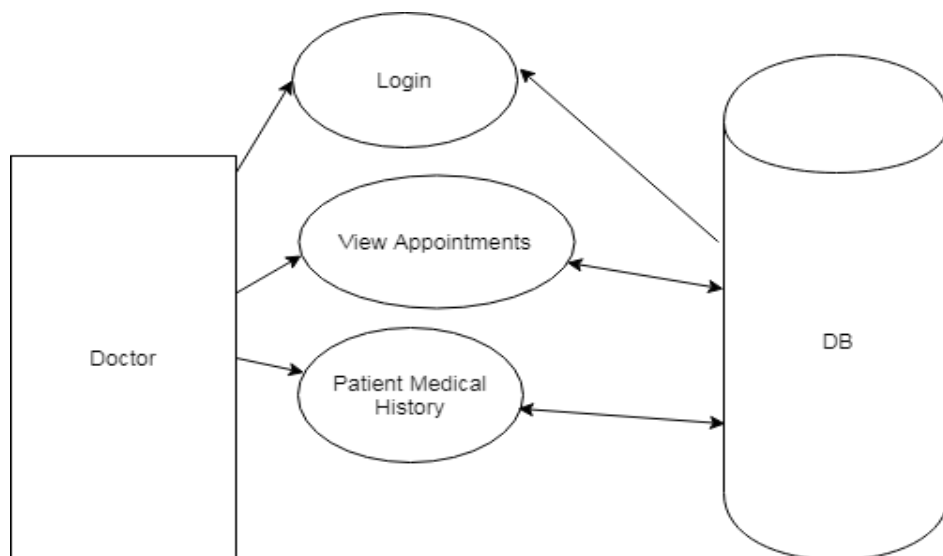


Fig 3.8 Doctor DFD

3.7.3 Admin Data Flow diagram

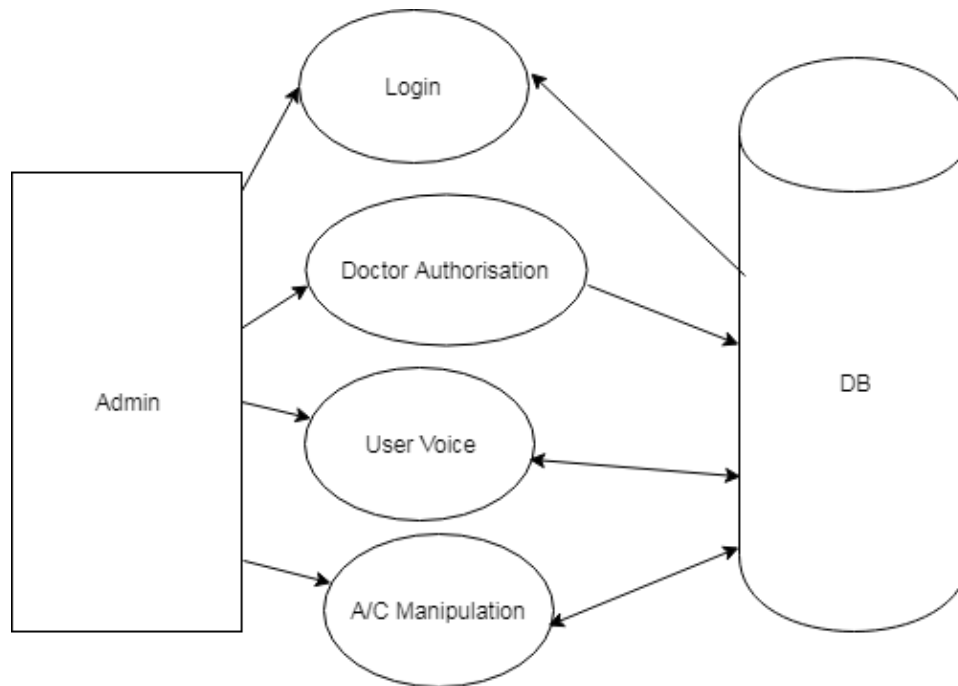


Fig 3.9 Admin DFD

3.8 System Requirements

3.8.1 Hardware Requirements

Client Side

- Android Smart Phone

Server Side

- 2 GHZ Processor
- 4 GB RAM
- 160 GB HDD
- Monitor, Keyboard & Mouse

3.8.2 Software Requirements

Client Side

- At least API 19 (KitKat)

Server Side

- Python with ML Libraries (Naive - Bias)
- MySQL
- Google Datasets
- Any Server OS

3.8.2.1 Android KitKat Mobile OS



Fig 3.10 Android KitKat Logo

Android is a mobile operating system developed by Google, based on a modified version of the Linux kernel and other open source software and designed primarily for touch screen mobile devices such as smart phones and tablets. In addition, Google has further developed Android TV for televisions, Android Auto for cars, and Wear OS for wristwatches, each with a specialized user interface. Variants of Android are also used on game consoles, digital cameras, PCs and other electronics. Initially developed by Android Inc., which Google bought in 2005, Android was unveiled in 2007, with the first commercial Android device launched in September 2008. The operating system has since gone through multiple major releases, with the current version being 9 "Pie", released in August 2018. The core Android source code is known as Android Open Source Project (AOSP), and is primarily licensed under the Apache License.

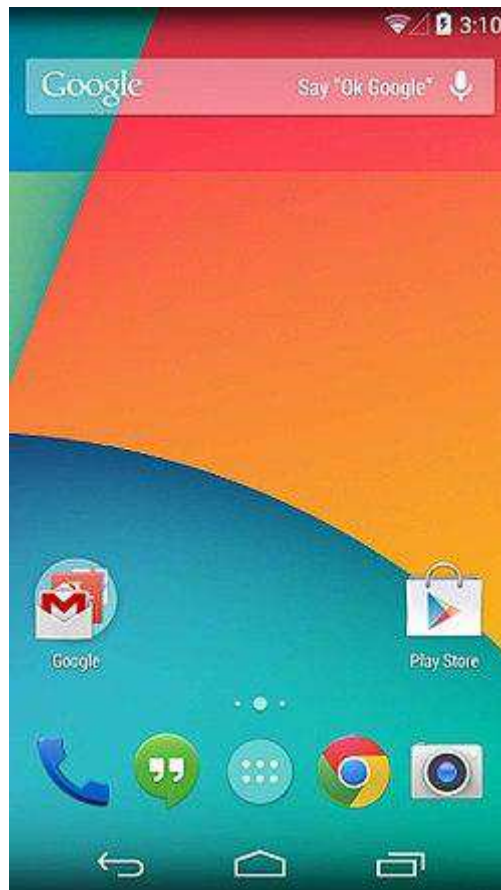


Fig 3.11 Android KitKat UI

Android is also associated with a suite of proprietary software developed by Google, called Google Mobile Services (GMS) that very frequently comes pre-installed in devices, which usually includes the Google Chrome web browser and Google Search and always includes core apps for services such as Gmail, as well as the application store and digital distribution platform Google Play, and associated development platform. These apps are licensed by manufacturers of Android devices certified under standards imposed by Google, but AOSP has been used as the basis of competing Android ecosystems, such as Amazon.com's Fire OS, which use their own equivalents to GMS.

Android has been the best-selling OS worldwide on smart phones since 2011 and on tablets since 2013. As of May 2017, it has over two billion monthly active users, the largest installed base of any operating system, and as of June 2018, the Google Play store features over 3.3 million apps. Android "KitKat" is a codename for the Android mobile operating system and the eleventh version of Android. Unveiled on September 3, 2013, KitKat focused primarily on optimizing the operating system for improved performance on entry-level devices with limited resources.

As of November 2018, statistics issued by Google indicate that 7.6% of all Android devices accessing Google Play run KitKat. The overall interface of KitKat further downplays the "Holo" interface appearance introduced on 4.0, replacing remaining instances of blue accenting with greys and white (such as the status bar icons). Apps may trigger a translucent status and navigation bar appearance, or trigger a full screen mode ("Immersive mode") to hide them entirely. The launcher also received a refreshed appearance, with the implementation of the translucent navigation bars, and the replacement of the black backdrop in the application drawer with a translucent backdrop. Additionally, action overflow menu buttons in apps are always visible, even on devices with the deprecated "Menu" navigation key. In the Settings menu, users can now specify a default Home (launcher) and text messaging app. On stock devices, the Messaging and Movie Studio apps were removed; the former was replaced by Google Hangouts, which supported SMS.

The AOSP Gallery app was also deprecated in favour of Google+ Photos. In certain apps; a new "Documents" file picker is available. A new runtime environment known as the Android Runtime (ART), intended to replace the Dalvik virtual machine, was introduced as a technology preview in KitKat. ART is a cross-platform runtime which supports the x86, ARM, and MIPS architectures in both 32-bit and 64-bit environments. Unlike Dalvik, which uses just-in-time compilation (JIT), ART compiles apps upon installation, which are then run exclusively from the compiled version from then on. This technique removes the processing overhead associated with the JIT process, improving system performance. Devices with 512 MB of RAM or less report themselves as "low RAM" devices. Using an API, apps may detect low RAM devices and modify their functionality accordingly. KitKat also supports zram. WebView components were updated to utilize a version of the Google Chrome rendering engine.

3.8.2.2 Python Programming Language



Fig 3.12 Python Logo

Python is an interpreted high-level programming and scripting language for general-purpose programming. Created by Guido van Rossum and first released in 1991, Python has a design philosophy that emphasizes code readability, notably using significant whitespace. It provides constructs that enable clear programming on both small and large scales. In July 2018, Van Rossum stepped down as the leader in the language community after 30 years. Python features a dynamic type system and automatic memory management. It supports multiple programming paradigms, named variables, default parameters including object-oriented, imperative functional and procedural, and has a large and comprehensive standard library. Python interpreters are available for many operating systems. CPython, the reference implementation of Python, is open source software and has a community-based development model, as do nearly all of Python's other implementations. Python and CPython are managed by the non-profit Python Software Foundation.

Python Machine Learning Libraries

Machine learning is the study of algorithms and mathematical models that computer systems use to progressively improve their performance on a specific task. Machine learning algorithms build a mathematical model of sample data, known as "training data", in order to make predictions or decisions without being explicitly programmed to perform the task. Machine learning algorithms are used in the applications of email filtering, detection of network intruders, and computer vision, where it is infeasible to develop an algorithm of specific instructions for performing the task. Machine learning is closely related to computational statistics, which focuses on making predictions using computers. The study of mathematical optimization delivers methods, theory and application domains to the field of machine learning. Data mining is a field of study within machine learning, and focuses on exploratory data analysis through unsupervised learning. In its application across business problems, machine learning is also referred to as predictive analytics.

Scikit-learn is one of the most popular ML libraries. It supports many supervised and unsupervised learning algorithms. Examples include linear and logistic regressions, decision trees, clustering, and k-means and so on. It builds on two basic libraries of Python, NumPy and SciPy. It adds a set of algorithms for common machine learning and data mining tasks, including clustering, regression and classification.

Even tasks like transforming data, feature selection and ensemble methods can be implemented in a few lines. For a novice in ML, Scikit-learn is a more-than-sufficient tool to work with, until you start implementing algorithms that are more complex.

Pandas is a very popular library that provides high-level data structures, which are simple to use as well as intuitive. It has many inbuilt methods for grouping, combining data and filtering as well as performing time series analysis. Pandas can easily fetch data from different sources like SQL databases, CSV, Excel, JSON files and manipulate the data to perform operations on it.

The best and most sophisticated ML is meaningless if you cannot communicate it to other people. So how do you actually turn around value from all data that you have? How do you inspire your business analysts and tell them “stories” full of “insights” This is where **Matplotlib** comes to the rescue. It is a standard Python library used by every data scientist for creating 2D plots and graphs. It is low-level, meaning it requires more commands to generate nice-looking graphs and figures than with some advanced libraries. However, the other side of that is flexibility. With enough commands, you can make just about any kind of graph you want with Matplotlib. You can build diverse charts, from histograms and scatter plots to non-Cartesian coordinate graphs. It supports different GUI back ends on all operating systems, and can export graphics to common vector and graphic formats like PDF, SVG, JPG, PNG, BMP, GIF, etc.

3.8.2.3 MySQL

MySQL the world's second most widely used open-source relational database management system (RDBMS). It is named after co-founder Michael Widenius's daughter, My. The SQL phrase stands for Structured Query Language. The MySQL development project has made its source code available under the terms of the GNU General Public License, as well as under a variety of proprietary agreements. MySQL was owned and sponsored by a single for-profit firm, the Swedish company MySQL AB, now owned by Oracle Corporation. MySQL is a popular choice of database for use in web applications, and is a central component of the widely used LAMP open source web application software stack (and other 'AMP' stacks). LAMP is an acronym for "Linux, Apache, MySQL, and Perl/PHP/Python".

Basic Commands

i) **USE database_name**

Change to the specified database. You need to change to some database when you first connect to MySQL.

ii) **Show Databases**

Lists all MySQL databases on the system

iii) **Show Tables [FROM database_name]**

Lists all tables from the current database or from the given database.

iv) **CREATE Tables**

```
CREATE TABLE table_name (column_name1 data_type (size),  
column_name2 data_type (size), column_name3 data_type (size) ...);
```

v) **DROP TABLE table_name**

Removes the table from the database. So, be careful with this command!

vi) **INSERT INTO Tables**

```
INSERT [INTO] table_name (column_name1, column_name2 ...)  
VALUES (value1, value2...);
```

vii) **DELETE FROM table_name WHERE where_clause**

Delete rows that meet the conditions of the where_clause. If the WHERE statement is omitted, the table is emptied, although its structure remains intact.

viii) **UPDATE Tables**

```
UPDATE table_name SET column_name1=value1, column_name2=value2 ...  
[WHERE where_clause];
```

Alters the data within a column based on the conditions in the where_clause.

ix) **SELECT Table Data**

```
SELECT column_name1, column_name2, /* ... FROM table_name;
```

3.8.2.4 Server OS

A server operating system, also called a server OS, is an operating system specifically designed to run on servers, which are specialized computers that operate within a client/server architecture to serve the requests of client computers on the network. The server operating system, or server OS, is the software layer on top of which other software programs, or applications, can run on the server hardware. Server operating systems help enable and facilitate typical server roles such as Web server, mail server, file server, database server, application server and print server.

3.8.3 Development Requirements

Android Studio

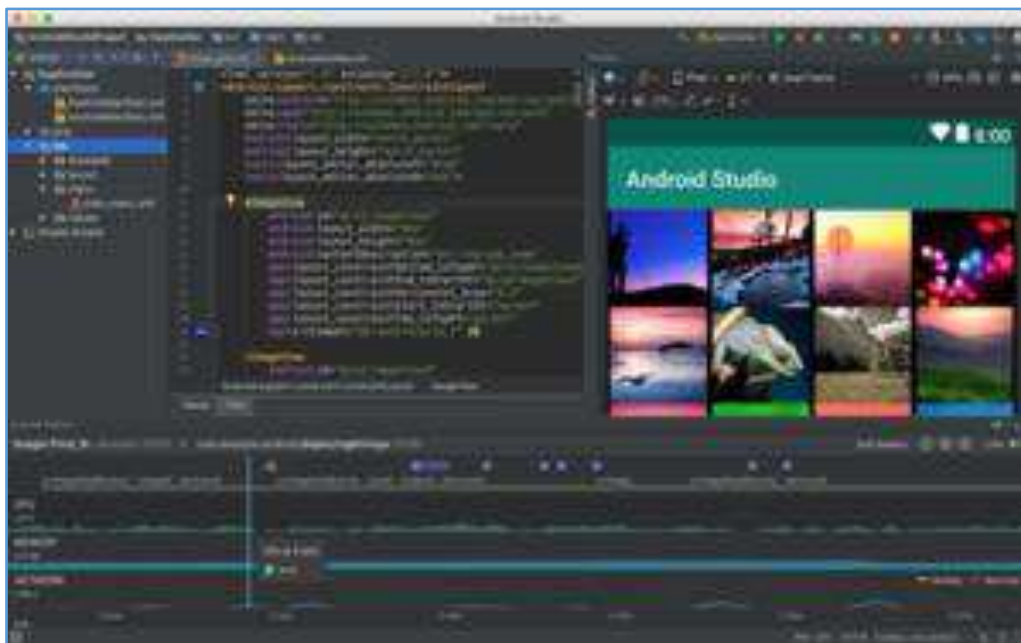


Fig 3.13 Android Studio UI

Android Studio is the official integrated development environment (IDE) for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. It is available for download on Windows, macOS and Linux based operating systems. It is a replacement for the Eclipse Android Development Tools (ADT) as the primary IDE for native Android application development. Android Studio was announced on May 16, 2013 at the Google I/O conference.

It was in early access preview stage starting from version 0.1 in May 2013, then entered beta stage starting from version 0.8, which was released in June 2014. The first stable build was released in December 2014, starting from version 1.0. The current stable version is 3.2.1, which was released in October 2018.

PyCharm

PyCharm is an integrated development environment (IDE) used in computer programming, specifically for the Python language. The Czech company develops it JetBrains. It provides code analysis, a graphical debugger, an integrated unit tester, integration with version control systems (VCSes), and supports web development with Django. PyCharm is cross-platform, with Windows, macOS and Linux versions. The Community Edition is released under the Apache License, and there is Professional Edition with extra features, released under a proprietary license. The beta version was released in July 2010, with the 1.0 arriving 3 months later.

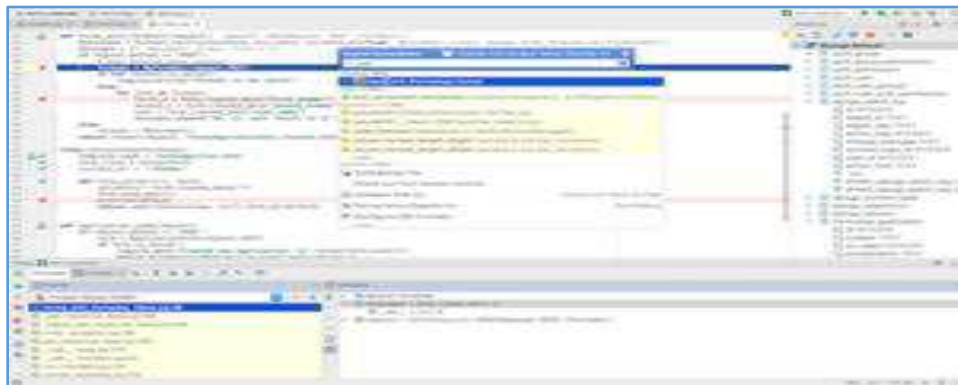


Fig 3.14 PyCharm UI

Version 2.0 was released on 13 December 2011, version 3.0 on 24 September 2013, and version 4.0 on November 19, 2014. PyCharm Community Edition, the open source version of PyCharm, became available on 22 October 2013.

phpMyAdmin

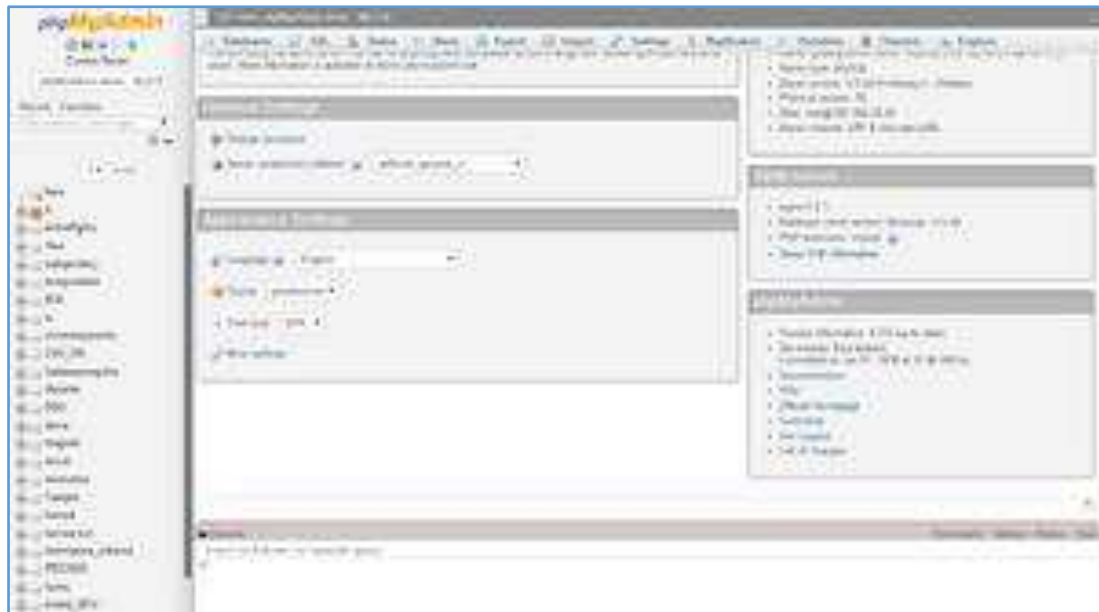


Fig 3.15 phpMyAdmin UI

PhpMyAdmin is a free and open source tool for MySQL and MariaDB. As a portable web application written primarily in PHP, it has become one of the most popular MySQL administration tools, especially for web hosting services. TobiasRatschiller, then an IT consultant and later founder of the software company Maguma, started to work on a PHP-based web front-end to MySQL in 1998, inspired by MySQL-Webadmin. He gave up the project (and phpAdsNew, of which he was also the original author) in 2000 because of lack of time. By that time, phpMyAdmin had already become one of the most popular PHP applications and MySQL administration tools, with a large community of users and contributors. In order to coordinate the growing number of patches, a group of three developers registered the phpMyAdmin Project at Source Forge & took the development.

MySQL Workbench



Fig 3.16 MySQL Workbench UI

It is a visual database design tool that integrates SQL development, database design, creation and maintenance into a single IDE for the MySQL database system. It is the successor to DB Designer 4 from fabFORCE.net, and replaces the previous package of software, MySQL GUI Tools Bundle. MySQL Workbench is the first MySQL family of products that offer two different editions - an open source and a proprietary edition. The "Community Edition" is a full featured product that is not crippled in any way. Being the foundation for all other editions it will benefit from all future development efforts. The proprietary "Standard Edition" extends the Community Edition with a series of modules and plugins. As Sun Microsystems announced this business decision soon after the takeover of MySQL, this has caused speculation in the press about the future licensing of the MySQL database.

CHAPTER 4

RESULTS AND DISCUSSION

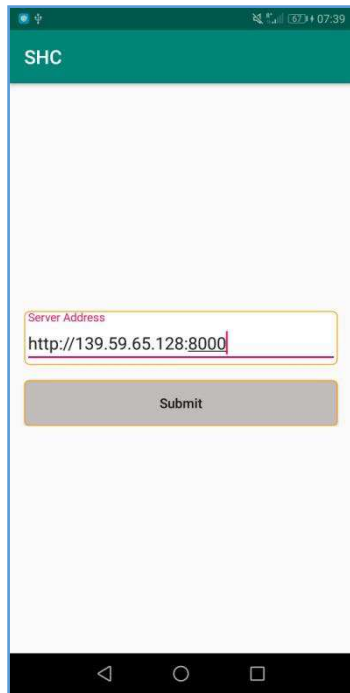


Fig 4.1 Server Configuration

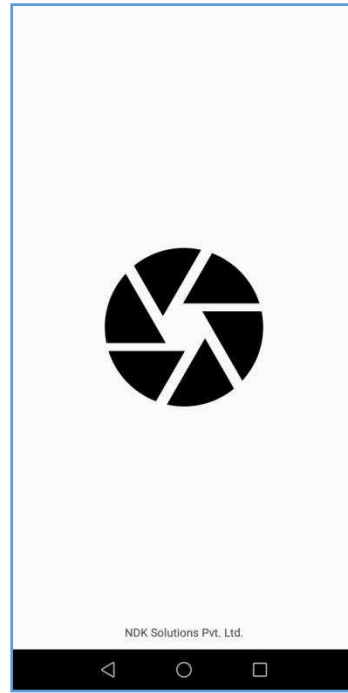


Fig 4.2 Launch Screen

In server configuration page (Fig 4.1) we can specify the address of the backend server where the API service for the client is configured. The main aim of the screen is the painless changing of the backend server address. In the launch screen (Fig 4.2) is the branding part of the Smart Health Consultation (SHC).It displays the application logo and the company name with animation effects.

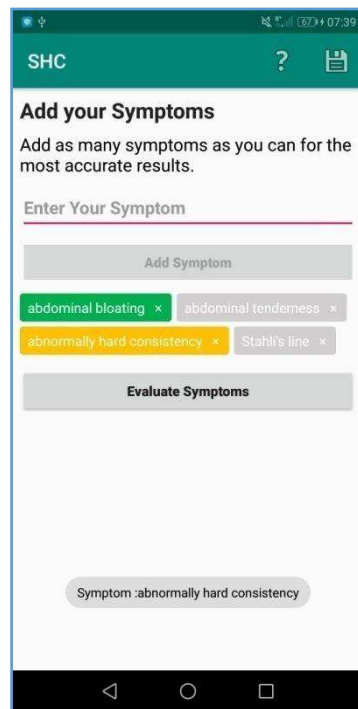


Fig 4.3 Add your symptoms

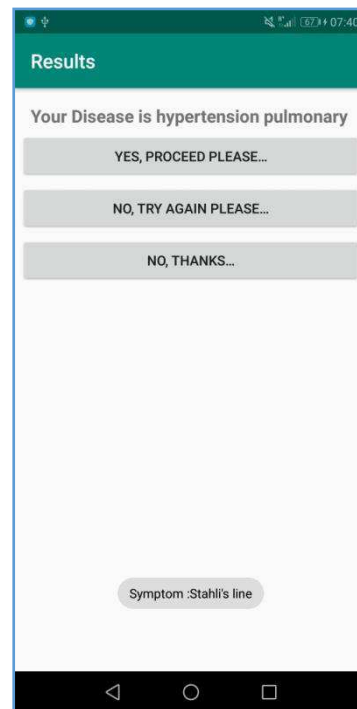
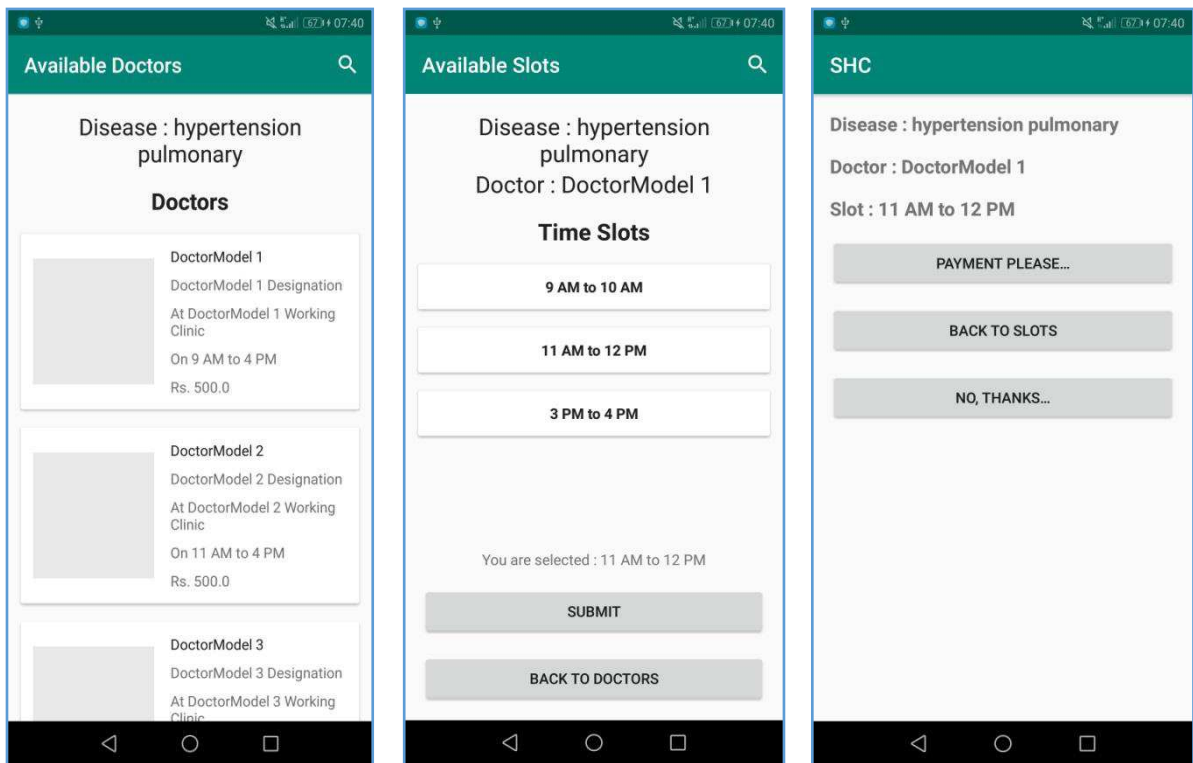


Fig 4.4 Prediction Results

Add your symptoms page serves us the input seeking screen for the symptom prediction process. It allows the user to add their symptoms in an interactive way. It contains an auto complete search box with tag pane in which the symptoms are displayed in a tagged manner. The user can trigger “Evaluate Symptoms” button for the initialisation of prediction process. In the prediction result page, it displays the result of disease prediction. The user can continue with prediction result or can retry the process or he can exit from the application.



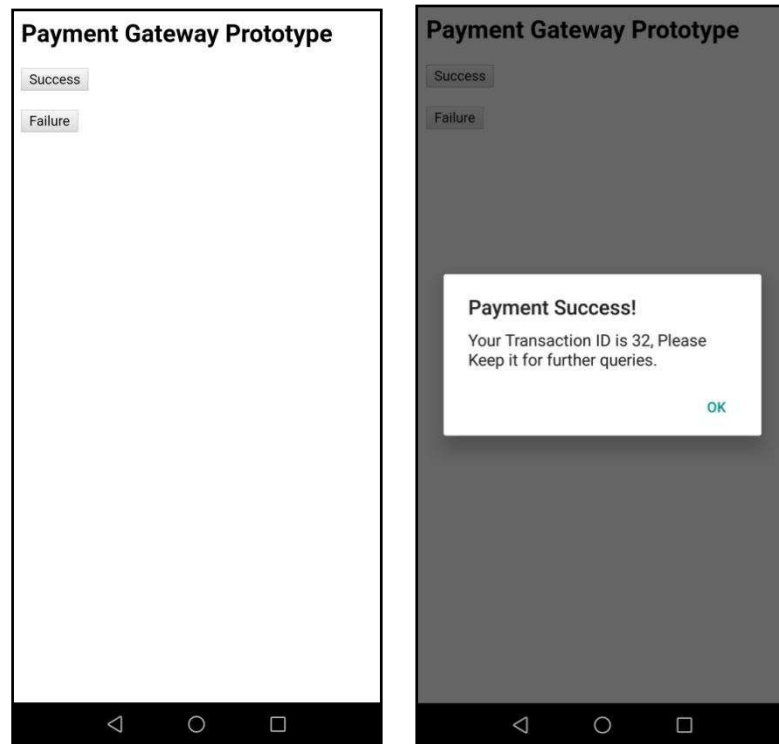
a) Doctor listing page

b) Appointment slots page

c) Appointment confirmation

Fig 4.5 Take Appointment Process

A Doctors listing page will show to the users a list of Doctors who are available for consultation for the predicted disease. The Doctor view contains necessary information such as name, photo for the quicker comparison. The user is free to choose one among them. In the Appointment slot listing page, a list of available appointment slots for the selected Doctor is displayed to the user. User is free to choose one among them. Also the user has the freedom to choose another Doctor. Fig 4.5 c depicts the Appointment confirmation page where the previously chosen options are displayed to the user. The user has the freedom to go back for changes in his selection or exit from the application. If the user is satisfied then they can move to the payment page.

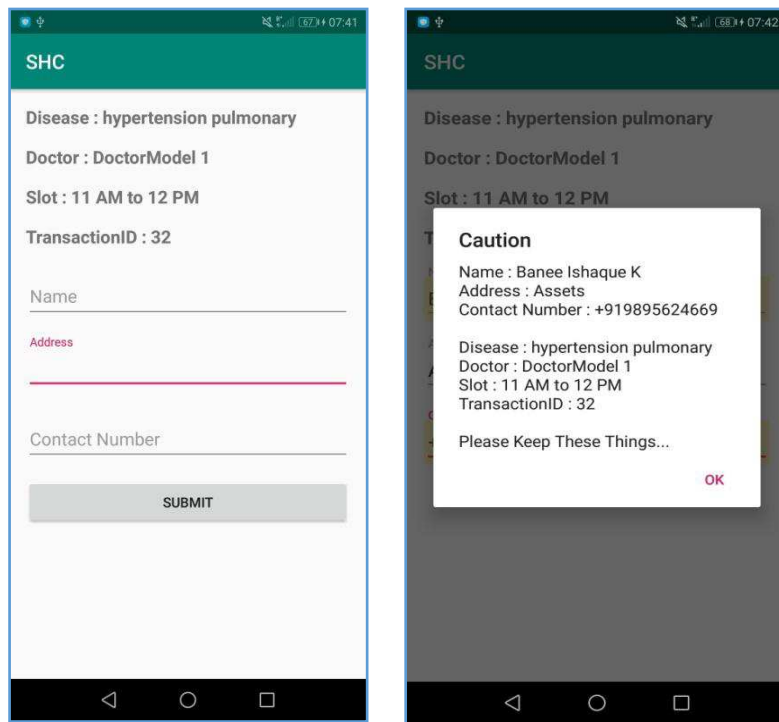


a) Payment page

b) Payment success alert

Fig 4.6 Payment Process

This is the prototype of an actual payment gateway. The gateway provides two results after processing of payment data like Debit card number CVV etc. These are payment failure and payment success. If the result is failure, we want to retry the payment, otherwise we can continue. The payment success alert is shown in Fig 4.6 b. The return value of the payment success is the transaction ID which can be used to identify the financial transaction.



a) Data collection page

b) Appointment receipt alert

Fig 4.7 Receipt Generation Process

In patient data collection page ,the user can state his or her details such as Name, Address and contact number .The appointment receipt alert gives a summary of his or her paid appointment with necessary details such as disease name, doctor's name, appointment slot, transaction ID and identification details.

CHAPTER 5

CONCLUSION AND FUTURE WORK

The “Smart health consultation” Android Application is helpful for patient to search the hospital based on specialist. This application is simplify the task of patient and doctor. This application facilitates the interaction between patient and doctor. It helps to optimize the work of patient and doctor. Installation of the app in the Smartphone is quite simple and more useful to patients who have normal idea of android mobile. Smart health consulting android system is an effortless, efficient and influential mobile application for the society.

As we have already mentioned, we address the problem of predicting diseases using “Decision Tree Algorithm” and their respective Doctor’s appointment time based on the symptoms. The focus was on the classification of symptoms based on their severity and importance and using this knowledge to calculate a numerical value to identify diseases. Although the method was tested in a limited environment with high accuracy, it can be extended to larger settings. We also provide a severity rating for the current condition, relative to the other users with similar symptoms. The test results for various medical conditions can be used to further improve the reliability of the system. Since the results are dependent on the experience of previous users, it is important to isolate genuine experiences from fake ones.

In the related works the application will be tested with more fast and accurate ML Algorithms for disease prediction. This is a location based system where doctor from a specific location will be displayed; in the future work the system will be extended to more locations for a wider access.

REFERENCES

- [1] **Shadab Adam Pattekari, Asma Parveen** (2012), "Prediction system for heart disease using naïve Bayes", *International journal of advanced computer and mathematical sciences* ISSN 2230-9624. Vol 3. Issue 3, pp 290-294.
- [2] **Mariam Daoud, Jimmy Xiangji Huang, William Melek, C. Joseph Kurian** (2013), "A semantic feature space for disease prediction".
- [3] **Sandeep Kaur, Sheetal Kalra** (2016), "Disease prediction using hybrid K-means and support vector machine".
- [4] **Satuluri Nagajaneyulu, Buraga Srinivasa Rao** (2018), "A novel feature selection based classification algorithm for real time disease prediction".
- [5] **Siri Krishan Wasan, Vasudha Bhatnagar, And Harleen Kaur** (2006), "The impact of data mining techniques on medical diagnostics", *Data Science Journal*: 119–126.
- [6] **Roshawna Scales, Mark Embrechts** (2002), "Computational intelligence techniques for medical diagnostics", *In Proceedings of Walter Lincoln Hawkins, Graduate Research Conference from the World Wide Web*.
- [7] **Yanwei, X.; Wang, J.; Zhao, Z.; Gao, Y** (2007), "Combination data mining models with new medical data to predict outcome of coronary heart disease". *Proceedings International Conference on Convergence Information Technology*.
- [8] **Sellappan Palaniappan, Rafiah Awang** (2008), "Intelligent Heart Disease Prediction System Using Data Mining Techniques", *IJCSNS International Journal of Computer Science and Network Security*, Vol.8 No.8.
- [9] **Niti Guru, Anil Dahiya, Navin Rajpal** (2007), "Decision Support System for Heart Disease Diagnosis Using Neural Network", *Delhi Business Review*, Vol. 8.
- [10] **Heon Gyu Lee, Ki Yong Noh, Keun Ho Ryu** (2007), "Mining Bio signal Data: Coronary Artery Disease Diagnosis using Linear and Nonlinear Features of HRV", *LNAI 4819: Emerging Technologies in Knowledge Discovery and Data Mining*.
- [11] **Shantakumar B. Patil, Y.S. Kumaraswamy** (2009), "Intelligent and Effective Heart Attack Prediction System Using Data Mining and Artificial Neural Network". *ISSN 1450-216X Vol.31 No.4* (2009), pp.642-656.

- [12] **Fahim, A. M., Salem, A. M., Torkey, F. A., & Ramadan, M. A.** (2006),” An efficient enhanced k-means clustering algorithm”. *Journal of Zhejiang University SCIENCE A*,7(10), 1626-1633
- [13] **Huang, C. L., Liao, H. C., & Chen, M. C.**(2008),”Prediction model building and feature selection with Support Vector Machines in breast cancer diagnosis”. *Expert Systems with Applications*, 34(1), 578-587.
- [14] **Xu, R., & Wunsch, D.** (2005),” Survey of clustering algorithms”’ *IEEE Transactions on Neural Networks*, 16, 645–678.
- [15] **Milovic, B., & Milovic, M.** (2012),”Prediction and decision making in Health Care using Data Mining”, *Kuwait Chapter of the Arabian Journal of Business and Management Review*, 1(12), 126.