

**A**  
**PROJECT REPORT**  
**On**  
**“Medicine Recommendation System**  
**Using Machine Learning”**

SUBMITTED TO THE SAVITRIBAI PHULE PUNE UNIVERSITY,  
IN PARTIAL FULFILLMENT FOR THE AWARD OF THE DEGREE  
OF  
**BACHELOR OF ENGINEERING**  
IN  
**ELECTRONICS AND TELECOMMUNICATION**

BY

Name	Exam Seat No:
<b>Mr. Vamsikrishna Subbarayudu Avula</b>	<b>Exam Seat No: B150883007</b>
<b>Mr. Pratik Yogesh Baisware</b>	<b>Exam Seat No: B150883008</b>
<b>Mr. Aditya Nilesh Hargane</b>	<b>Exam Seat No: B150883022</b>

UNDER THE GUIDANCE OF  
**Prof. Prajakta Khairnar**



**Department of Electronics & Telecommunication Engineering**  
**Dr. D. Y. PATIL SCHOOL OF ENGINEERING Charholi Bk., via Lohegaon,**  
**Pune-412105 Year:2021-2022**

## **CERTIFICATE**

This is to certify that the project report entitled

**“Medicine Recommendation System  
Using Machine Learning”**

Submitted by

**Mr. Vamsikrishna Subbarayudu Avula**

**Exam Seat No: B150883007**

**Mr. Pratik Yogesh Baisware**

**Exam Seat No: B150883008**

**Mr. Aditya Nilesh Hargane**

**Exam Seat No: B150883022**

is a Bonafede work carried out by them at D.Y. Patil School of Engineering, Lohegaon, under the supervision of **Prof. Prajakta Khairnar** and it is approved for the partial fulfilment of the requirement of Savitribai Phule Pune University, for the award of the degree of Bachelor of Engineering (Electronics & Telecommunication Engineering). The work presented in project report has not been submitted to any other institute or University for the award of any degree.

Prof. Prajakta Khairnar

**Project Guide**

Dr. Saniya Ansari

**Project Co-ordinator**

Dr. S. M. Koli

**H.O.D(E&TC)**

Dr. F. B. Sayyad

**Principal**

## EXAMINATION APPROVAL CERTIFICATE

This is to certify that

**Mr. Vamsikrishna Subbarayudu Avula**

**Exam Seat No: B150883007**

**Mr. Pratik Yogesh Baisware**

**Exam Seat No: B150883008**

**Mr. Aditya Nilesh Hargane**

**Exam Seat No: B150883022**

Have satisfactorily completed and presented report on topic “**Medicine Recommendation System Using Machine Learning**” at D. Y. Patil School of Engineering, Lohegaon in partial fulfilment of requirement of Savitribai Phule Pune University for the student of B.E. (Electronics and Telecommunication Engineering) in semester VI during academic year 2021-22

Examiners:

\_\_\_\_\_  
Internal Examiner

\_\_\_\_\_  
External Examiner

Date:

Place:

## Acknowledgment

We take this opportunity to thank all the individuals for their guidance, help and timely support which made us to complete the project in stipulated time.

We are highly indebted to **Dr. Saniya Ansari** our Project Co-ordinator, and Project Guide **Prof. Prajakta Khairnar** and well-wisher for he! valuable guidance, constant encouragement, stimulating discussions and extensive help leading to successful completion of the work. Her attitude at work, approach and versatility and objectivity are worth stating.

We extend thanks to ours. Principal **Dr. F. B. Sayyad** and all other administrative officials of Dr. D.Y. Patil School .of Engineering, for their support. We extend our thanks to all teaching and non-teaching staff in Department of Electronics and Telecommunication and for their constant encouragement throughout this work.

# INDEX

<b>CONTENTS</b>	<b>Page No.</b>
<b>LIST OF FIGURES</b>	<b>i</b>
<b>LIST OF TABLES</b>	<b>i</b>
<b>ABSTRACT</b>	<b>ii</b>
<b>CHAPTER 1: INTRODUCTION</b>	
1.1 Overview	1
1.2 Background	2
1.2 Aim of Project	2
1.4 Problem Statement	2
1.5 Objective	2
1.6 Advantages	2
1.7 Summary	3
<b>CHAPTER 2: LITERATURE SURVEY</b>	
Literature	4
<b>CHAPTER 1: METHODOLOGY</b>	
3.1 Block diagram	11
3.2 Algorithms	11
3.3 Libraries	15
3.4 UI Design	16
3.5 Code	18

## **CHAPTER 4: RESULT**

4.1 Results	66
-------------	----

## **CHAPTER 5: CONCLUSION AND FUTURE SCOPE**

5.1 Conclusion & Future scope	68
-------------------------------	----

<b>REFERENCES</b>	<b>69</b>
-------------------	-----------

## LIST OF FIGURES

<b>Figure Name</b>	<b>Page No.</b>
Figure 1: Block diagram of System	11
Figure 2: Accuracy Graph	14
Figure 3: Block diagram of Machine Learning model	14
Figure 4: Entry Page of Web-Site	16
Figure 5: Symptoms Check Page of Web-Site	16
Figure 6: Contact Page of Web-Site	17
Figure 7: MySQL Workbench	17
Figure 8: Result 1	67
Figure 9: Result 2	67

## LIST OF TABLES

<b>Table Name</b>	<b>Page No.</b>
Table 1: Final Prediction and Level of Prediction of Diseases	12
Table 2: Algorithms and Accuracy	66

## **ABSTRACT**

Most of the people tend to live a long and healthy life, but people are busy in their day-to-day life and it is not possible for everyone to visit doctors for minor symptoms of a disease. Many of people do not know about medicines and to visit a doctor and consult for minor symptoms for medicines it is time consuming process. As AI and machine learning like emerging technology can help us to create a recommend system that will prescribe medicine and this system can predict accurately a medicine to user. In this paper proposes the medicine recommend system which will predict disease and medicine according to symptoms entered by patients/user.



# CHAPTER 1

## INTROCUCTION

### 1.1 Overview

Nowadays, people are busy in their day-to-day life, and it is not feasible for everyone to visit doctor for minor symptoms of a disease. To visit a hospital is time consuming process and in recent Covid-19 pandemic time all hospitals were too busy, it was impossible to visit doctors for minor symptoms. Many of people had taken wrong medicines in that panic situation. There was no one to recommend. The precision medicine plays an important role to provide quality treatment and individually care for each patient.

Now as the era of Artificial intelligence (AI) came in existence the area of computer applications gets significantly boost up. The concept of artificial intelligence is nothing but the simulation of the human intelligence processed in computers. The development of artificial intelligent is based on the process of machine learning which includes getting information, evolving rules for extracting the information, illustrating approximate or definite inferences and verification. The successes of artificial intelligent are based on the accuracy of machine learning algorithms.

The accuracy of machine learning algorithm is mainly based on the availability of significant training dataset. Now days, we have enormous data for training a system. In this work, we are trying to analyze and explore the suitable medicine for a disease recommended by our system. Our research is to build a Machine Learning based system that can recommend the medicine based on the disease symptoms. We have seen that there are many diseases that share common medicines for treatment, if symptoms are common between the disease. So, the algorithm finds most common disease then suggest the medicine to user.

## **1.2 Background**

Out of the pressure of Digital Transformation, the major industrial domains are using advanced and efficient digital technologies to implement processes that are applied on a daily basis. Unfortunately, this still does not happen in the same way in the medical domain. It could be revolutionizing the medical sectors, already doctors are very busy and recent COVID-19 pandemics all hospitals were too busy, it was impossible to visit hospitals for minor disease and symptoms. Using AI (Artificial Intelligence) we can create recommender system, that can reduce the work load of doctors and hospitals.

## **1.3 Aim**

To design and implement a system that will predict the disease and prescribe the medicine of the disease using Machine Learning.

## **1.4 Problem Statement**

Nowadays, people are busy in their day-to-day life, and it is not feasible for everyone to visit doctor for minor symptoms of a disease. It is also a time spending process to visit a doctor and consult him for minor disease. In modern time people want everything faster or less timing consuming.

## **1.5 Objective**

- This system will predict disease according to the symptoms that are entered by user/patients.
- System prescribes medicine according to the disease.
- It will be highly accurate.
- Easy to use for every user

## **1.6 Advantages**

- Suggest Quality Medicine.
- Time efficient
- Cost efficient
- Available to everyone and at any time.
- No middleman.
- Multiple patients can get medication at any time.

## **1.7 Summary**

This chapter gives a brief overview of Medicine Recommend System Using Machine Learning. Application of Machine Learning and three algorithms are well explained in this chapter. It gives a brief look on problem definition and objective of overall system.

## **CHAPTER 2**

### **LITERATURE SURVEY**

Since coronavirus has shown up, inaccessibility of legitimate clinical resources is at its peak, like the shortage of specialists and healthcare workers, lack of proper equipment and medicines etc. The entire medical fraternity is in distress, which results in numerous individual's demise. Due to unavailability, individuals started taking medication independently without appropriate consultation, making the health condition worse than usual. As of late, machine learning has been valuable in numerous applications, and there is an increase in innovative work for automation. This paper intends to present a drug recommender system that can drastically reduce specialist's heap. In this research, we build a medicine recommendation system that uses patient reviews to predict the sentiment using various vectorization processes like Bow, TF-IDF, Word2Vec, and Manual Feature Analysis, which can help recommend the top drug for a given disease by different classification algorithms. The predicted sentiments were evaluated by precision, recall, f1score, accuracy, and AUC score. The results show that classifier Linear SVC using TF-IDF vectorization outperforms all other models with 93% accuracy<sup>[1]</sup>.

Most of the people tend to live a long and healthy life, where they are more conscious about their health. But many studies show that almost many people die due to the medical errors caused in terms of taking wrong medicines and these errors are caused by doctors, who prescribe medicines based on their experiences which are quite limited. As machine learning, deep learning and data mining like technologies that are emerging day by day, these technologies can help us to explore the medical history and can reduce medical errors by being doctor friendly. In this paper proposes a medicine recommendation system, which takes the patient review data and performs sentiment analysis on it to find the best medicine for a disease by using N-Gram model. In order to increase the accuracy, a Light model is used to perform medication analysis. The paper also discusses the advantages, disadvantages and enhancements that can be incorporated to improve the accuracy<sup>[2]</sup>.

Medicine recommender systems can assist the medical care providers with the selection of an appropriate medication for the patients. The advanced technologies available nowadays can help developing such recommendation systems which can lead to more concise decisions. Many existing medicine recommendation systems are developed based on different algorithms. Thus, it is crucial to understand the state-of-the-art developments of these systems, their advantages and disadvantages as well as areas which require more research. In this paper, we conduct a literature review on the existing solutions for medicine recommender systems, describe and compare them based on various features, and present future research directions <sup>[3]</sup>.

In this paper, we review the existing medicine recommendation system solutions, and compare them based on various features. The goal is to demonstrate the existing solutions for the healthcare providers in order to improve the medicine selection process and select an appropriate medication for the patients <sup>[4]</sup>.

Databases can contain information about the author(s) and his/their published scientific works or results of research/investigation, including bibliographic data, abstract or full text of the paper. The databases are collecting and processing the best scientific and professional papers, or reviews and case reports published in scientific and professional journals or other publications. The reliability and quality of information guarantees producers of databases. Most important databases are located in famous university/academic centres like Bethesda [National Library Medicine (NLM)], Philadelphia (ISI), Amsterdam (Elsevier), Ipswich (EBSCO), Geneva (WHO), Moscow (RAS), Shiraz [Islamic World Science Citation Centre (ISC)], Warsaw [Index Copernicus (IC)]. Author of this review article shortly described most important online databases of biomedical literature today which will be useful for scientists or other medical professionals <sup>[5]</sup>.

Machine Learning (ML) has unfolded from the Artificial Intelligence, a field of computer science. Machine Learning (ML) is multidisciplinary field, a combination of statistics and computer science algorithms which is widely used in predictive analyses and classification. The second section of the paper focus to influence the basic machine learning methods and algorithms. This paper will go through the various machine learning tools needed to run the machine learning projects. The main concern of concerned paper is, the study the main approaches and case studies of using machine learning for forecasting in different areas such stock price forecasting, tourism demand forecasting, solar irradiation forecasting, supply chain demand and consideration of neural network in machine learning methods <sup>[6]</sup>.

Recommender System (RS) is one of the most popular applications of Artificial Intelligence which attracted researchers all around the world. Many machine learning algorithms are used to develop RSs. Choosing the best machine learning algorithm to provide users with a product or service is the most challenging task in the area of RSs. Now we are witnessing a paradigm shift in the purchase habits of people from in-shop to online resulting in the availability of online information exponentially growing every day. The ever-increasing online information and the number of online users create new avenues in RS. In an online shopping scenario, these systems must be able to recommend relevant items to the users. The RSs have to deal with the huge amount of information by filtering the relevant information based on the analysis made on the inputs made by the users during their online sessions. These systems can recommend appropriate items to users based on their interest and previous preference which can lead to increased sales. The three major techniques used to build a RS are content-based, collaborative based and hybrid-based. This paper presents the various applications of RSs and makes a detailed comparative study of different machine learning approaches used. The methodologies used for identifying research articles for analysis, the merits and demerits of different techniques in RSs and domain-specific applications of these techniques are well explained here with scientific review analysis <sup>[7]</sup>.

Recommender systems use algorithms to provide users with product or service recommendations. Recently, these systems have been using machine learning algorithms from the field of artificial intelligence. However, choosing a suitable machine learning algorithm for a recommender system is difficult because of the number of algorithms described in the literature. Researchers and practitioners developing recommender systems are left with little information about the current approaches in algorithm usage. Moreover, the development of a recommender system using a machine learning algorithm often has problems and open questions that must be evaluated, so software engineers know where to focus research efforts. This paper presents a systematic review of the literature that analyses the use of machine learning algorithms in recommender systems and identifies research opportunities for software engineering research. The study concludes that Bayesian and decision tree algorithms are widely used in recommender systems because of their relative simplicity, and that requirement and design phases of recommender system development appear to offer opportunities for further research <sup>[8]</sup>.

More and more people are hearing about the health and medical diagnosis problems. However, according to the administration's report, more than 200 thousand people in China, even 100

thousand in USA, die each year due to medication errors. More than 42% medication errors are caused by doctors because experts write the prescription according to their experiences which are quite limited. Technologies as data mining and recommender technologies provide possibilities to explore potential knowledge from diagnosis history records and help doctors to prescribe medication correctly to decrease medication error effectively. In this paper, we design and implement a universal medicine recommender system framework that applies data mining technologies to the recommendation system. The medicine recommender system consists of database system module, data preparation module, recommendation model module, model evaluation, and data visualization module. We investigate the medicine recommendation algorithms of the SVM (Support Vector Machine), BP neural network algorithm and ID3 decision tree algorithm based on the diagnosis data. Experiments are done to tune the parameters for each algorithm to get better performance. Finally, in the given open dataset, SVM recommendation model is selected for the medicine recommendation module to obtain a good trade-off among model accuracy, model efficiency, and model scalability. We also propose a mistake-check mechanism to ensure the diagnosis accuracy and service quality. Experimental results show our system can give medication recommendation with an excellent efficiency, accuracy and scalability <sup>[9]</sup>.

Nowadays people are progressively started caring about the health and medical diagnosis problems. However, according to the administration's report, more than 1 crore people every year die due to medication error done by novices (New doctor's). More than 42% medication errors are caused by doctors because they provide prescriptions according to their experience which are quite limited. And sometimes they have left many parts of the book they have read. Technologies as data mining and recommender technologies provide possibilities to explore potential knowledge from diagnosis history and help the doctors to prescribe medication correctly to decrease the medication error. In this recommendation we will design and implement a universal medicine recommender system framework that applies data mining technologies to the recommendation system. The medicine recommender system consists of database system module, recommendation model module, model evaluation, and data visualization module. We investigated different medicine recommendation algorithms which are generally used in recommendation system SVM (Support Vector Machine), BP neural network algorithm and ID3 decision tree algorithm based on the diagnosis data. Each algorithm is checked to get better performance. Finally, in the given open data set, SVM recommendation model is selected for the medicine recommendation module to obtain a good trade-off among

model accuracy and model efficiency, Experimental results shows that our system will be able to give proper medication recommendation <sup>[10]</sup>.

Identification of drug-drug and drug-diseases interactions can pose a difficult problem to cope with, as the increasingly large number of available drugs coupled with the ongoing research activities in the pharmaceutical domain, make the task of discovering relevant information difficult. Although international standards, such as the ICD-10 classification and the UNII registration, have been developed in order to enable efficient knowledge sharing, medical staff needs to be constantly updated in order to effectively discover drug interactions before prescription. The use of Semantic Web technologies has been proposed in earlier works, in order to tackle this problem <sup>[11]</sup>.

Recommendation system is a data filtering technique. They are used to provide suggestions to the users according to their interest and need. It is a very popular technique in recent years and used by many e-commercial websites and other platforms to recommend news, books, movies, shopping items, novels, music and much more that is why recommendation system has become a hot topic. Recommendation systems are the subset of data filtering systems. The different types of recommendation systems are used in different platforms and have become an important part of various applications. It is a decision-making process that will help the users to buy items in which they are interested. Recommendation systems are very useful and effective technique of filtering the data. This paper is a review of recommendation systems that will describe recommendation system, how it works and helps in different platforms, and the different types of it with their merits and limitations <sup>[12]</sup>.

Nowadays, the recommendation system has made finding the things easy that we need. Movie recommendation systems aim at helping movie enthusiasts by suggesting what movie to watch without having to go through the long process of choosing from a large set of movies which go up to thousands and millions that is time consuming and confusing. In this article, our aim is to reduce the human effort by suggesting movies based on the user's interests. To handle such problems, we introduced a model combining both content-based and collaborative approach. It will give progressively explicit outcomes compared to different systems that are based on content-based approach. Content-based recommendation systems are constrained to people, these systems don't prescribe things out of the box, thus limiting your choice to explore more. Hence, we have focused on a system that resolves these issues <sup>[13]</sup>.



Due to increase of data on internet, there is an increased dependency on internet by people. Thus, recommendation systems help people by suggesting products where there is overload of information on e-commerce websites. There are various methods for recommendation. This paper studies about various techniques used in designing of recommendation system with machine learning algorithm <sup>[14]</sup>.

Recommender systems use algorithms to provide users with product or service recommendations. Recently, these systems have been using machine learning algorithms from the field of artificial intelligence. However, choosing a suitable machine learning algorithm for a recommender system is difficult because of the number of algorithms described in the literature. Researchers and practitioners developing recommender systems are left with little information about the current approaches in algorithm usage. Moreover, the development of a recommender system using a machine learning algorithm often has problems and open questions that must be evaluated, so software engineers know where to focus research efforts. This paper presents a systematic review of the literature that analyses the use of machine learning algorithms in recommender systems and identifies research opportunities for software engineering research. The study concludes that Bayesian and decision tree algorithms are widely used in recommender systems because of their relative simplicity, and that requirement and design phases of recommender system development appear to offer opportunities for further research <sup>[15]</sup>.

A database is a system used to manage data on a computer system. There are several database work systems that have their own laws and ways of working. Data are arranged in various levels. In computer data are classified in a hierarchy. A higher level consists of one or more data at a lower level. Example: a folder has several sub folders; some subfolders have several files. Management of database management requires a tool / tool to be able to manage it, so that database management can continue to be managed and continue to improve its performance. With the existence of an information system, an organization will strive to be more competitive and efficient, which in turn adds value to obtaining, changing, and distributing information with the aim of increasing decision making, increasing organizational performance in achieving its organizational goals. An effective Information System provides accurate, timely, and relevant information to users so that it can be used for decision making. In making decisions, both in daily operations, as well as in strategic planning into the future. The decision-making process

must be based on timely and appropriate data and information so that the decisions taken are on target. Information is obtained from data processing, and data processing is carried out by information systems with the support of information technology <sup>[16]</sup>.

In this paper, we would like to discuss the methods and ideologies used to create a database to be used for Human Resource purposes. Because we want this database to be accessible anywhere at any time, it is safe to conclude that an internet-based (web-based) database would work best, therefore we chose MySQL as the database management system. Before diving deep into the making of the database itself, it is important to understand certain basics of database design and the phases of the database life cycle itself. This paper will conclude on a few of the basic things to understand before designing a database for Human Resource Management on MySQL <sup>[17]</sup>.

Cutting edge improved techniques gave greater values to Artificial Intelligence (AI) and Machine Learning (ML) which are becoming a part of interest rapidly for numerous types of research presently. Clustering and Dimensionality Reduction Techniques are one of the trending methods utilized in Machine Learning these days. Fundamentally clustering techniques such as K-means and Hierarchical is utilized to predict the data and put it into the required group in a cluster format. Clustering can be utilized in recommendation frameworks, examination of clients related to social media platforms, patients related to diseases of specific age groups can be categorized, etc. While most aspects of the dimensionality lessening method such as Principal Component Analysis and Linear Discriminant Analysis are a bit like the clustering method, but it decreases the data size and plots the cluster. In this paper, a comparative and predictive analysis is done utilizing three different datasets namely IRIS, Wine, and Seed from the UCI benchmark in Machine learning on four distinctive techniques. The class prediction analysis of the dataset is done employing a flask-app. The main aim is to form a good clustering pattern for each dataset for given techniques. The experimental analysis calculates the accuracy of the shaped clusters used different machine learning classifiers namely Logistic Regression, K-nearest neighbors, Support Vector Machine, Gaussian Naïve Bayes, Decision Tree Classifier, and Random Forest Classifier. Cohen Kappa is another accuracy indicator used to compare the obtained classification result. It is observed that Kmeans and Hierarchical clustering analysis provide a good clustering pattern of the input dataset than the dimensionality reduction techniques. Clustering Design is well-formed in all the techniques. The KNN classifier provides an improved accuracy in all the techniques of the dataset <sup>[18]</sup>.

## CHAPTER 3

### METHODOLOGY

#### 3.1 Block Diagram

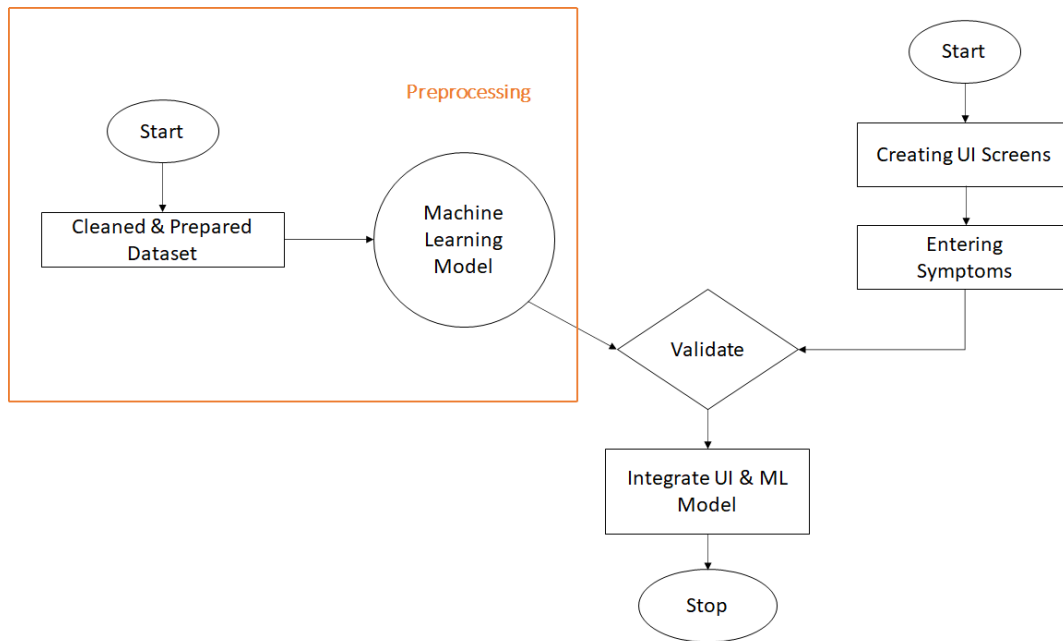


Figure 1: Block diagram of System

#### 3.2 Algorithms

Our Medicine Recommend System is implemented using the three data mining algorithms i.e., Decision Tree classifier, Random Forest classifier and Naive Bayes classifier. First, we have separately trained our disease prediction system using all the three classifiers then analyzed the results. The prediction accuracy is very much low, the result we have found that based on the symptoms, in many cases, same diseases are predicted. As the accurate prediction and claiming of a particular disease is very important for the correct treatment of a patient. Therefore, we have used three different to obtained more accurate prediction. if all classifiers are predicting the different diseases, then final prediction is considered on the basis of Naïve Bayes classifier. Because, Naïve based classifier gives the more accuracy and also it doesn't have problem of overfitting.

<i>Machine Learning Algorithms</i>	<i>Disease (If all models predict the same disease)</i>	<i>Disease (If two models predict the same disease)</i>	<i>Disease (If all three models predict different disease)</i>
<i>Decision Tree</i>	<i>Diabetes</i>	<i>Hepatitis B</i>	<i>Chicken Pox</i>
<i>Random Forest</i>	<i>Diabetes</i>	<i>Hepatitis B</i>	<i>Allergy</i>
<i>Naive Bayes</i>	<i>Diabetes</i>	<i>Hepatitis C</i>	<i>Drug reaction</i>
<i>Final Prediction</i>	<i>Diabetes</i>	<i>Hepatitis B</i>	<i>Drug reaction</i>
<i>Prediction Level</i>	<i>Strong</i>	<i>Average</i>	<i>Low</i>

*Table 1: Final Prediction and Level of Prediction of Diseases*

### **3.2.1 Decision Tree Classifier**

It is a classification model which frames a decision tree. In this tree, every node specifies a test over the attribute, every branch is generated from that node resembles to one of the promising values of that attribute. By learning the series of overt ‘if-then’ rules on feature values, it divides the dataset into smaller and smaller subsets which results in predicting our objective. The decision tree classifier has two components which is decision nodes and leaf nodes.

- **Decision node:** If a node is further splits into sub-nodes, then this node is called as the decision node. In this presented work, all the symptoms are considered as decision nodes.

- Leaf node: The nodes from which there is no subordinate nodes coming off are considered as leaf nodes. In other words, they don't further split the data anymore. At the level of leaf nodes, we achieve the classification level. Leaf node represents the classification which is the decision of a class. In this work the diseases are correspond to the leaf nodes.

### **3.2.2 Random Forest Classifier**

Random forest is a popular machine learning algorithm that gives excellent results most of the time. It is pretty easy to use for the classification purpose. The drawback of using decision tree algorithm is that it suffers from the overfitting problems. Basically, Random Forest classifier crafts a set of decision trees from an arbitrarily chosen subset of the training set. Finally, it collects the outcomes from different decision trees to decide the final prediction. It is a kind of ensemble learning based meta estimator that ensembles a many decision tree classifiers on various sub-samples of the data.

### **3.2.3 Naive Bayes Classifier**

Naive Bayes classifier is a supervised learning approach. It uses the Bayes theorem concept for solving the classification problems. It is mostly appropriate to use in those classification problem which has a high-dimensional dataset. It is one of the simplest and effective classification algorithms which can be used in the rapid development of the machine learning models with quick predictions. The basic Naive Bayes concept is that each feature contributes independently and equally towards obtaining the results. One more specialty of this algorithm is; it needs very less computational power.

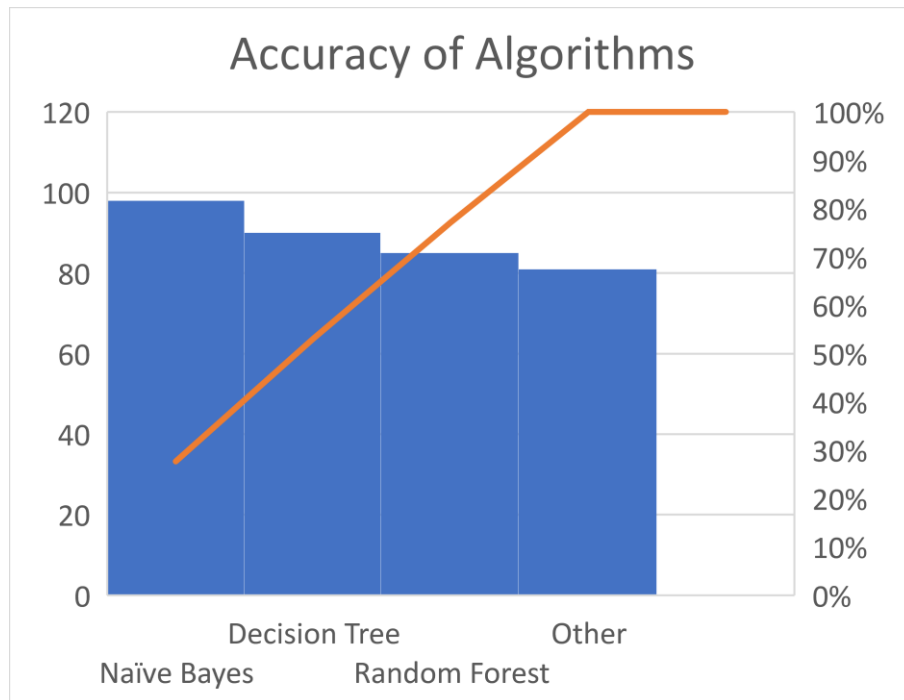


Figure 2: Accuracy Graph

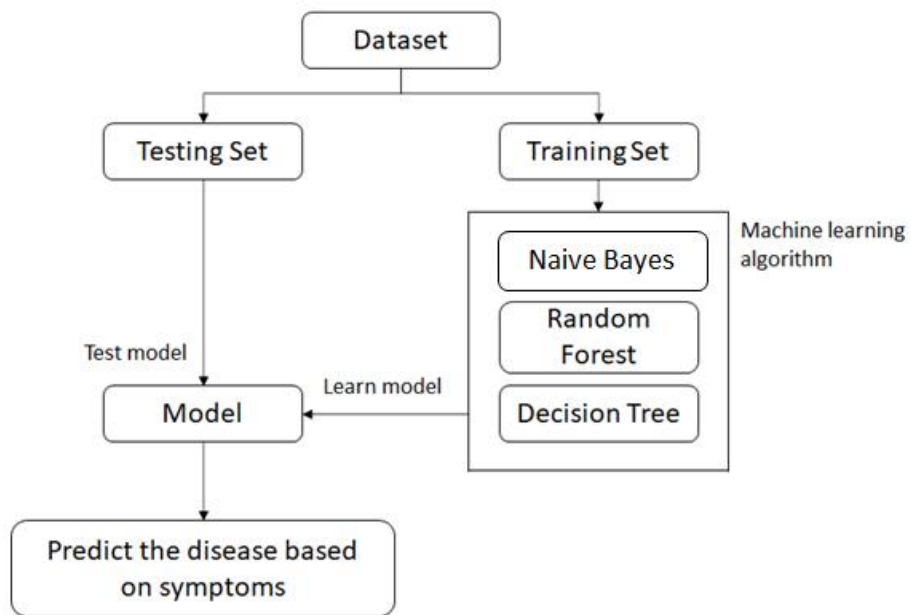


Figure 3: Block diagram of Machine Learning Model

### **3.3 Libraries**

Python's standard library is very extensive, offering a wide range of facilities. The library contains built-in modules (written in C) that provide access to system functionality such as file I/O that would otherwise be inaccessible to Python programmers, as well as modules written in Python that provide standardized solutions for many problems that occur in everyday programming. Some of these modules are explicitly designed to encourage and enhance the portability of Python programs by abstracting away platform-specifics into platform-neutral APIs.

#### **3.3.1 NumPy**

NumPy is the fundamental package for scientific computing in Python. It is a Python library that provides a multidimensional array object, various derived objects (such as masked arrays and matrices), and an assortment of routines for fast operations on arrays, including mathematical, logical, shape manipulation, sorting, selecting, I/O, discrete Fourier transforms, basic linear algebra, basic statistical operations, random simulation and much more.

#### **3.3.2 Pandas**

Pandas is mainly used for data analysis and associated manipulation of tabular data in Data frames. Pandas allows importing data from various file formats such as comma-separated values, JSON, Parquet, SQL database tables or queries, and MS Excel. Pandas allows various data manipulation operations such as merging, reshaping, selecting, as well as data cleaning, and data wrangling features.

#### **3.3.3 Pickle File**

Python pickle module is used for serializing and de-serializing a Python object structure. Any object in Python can be pickled so that it can be saved on disk. What pickle does is that it "serializes" the object first before writing it to file. Pickling is a way to convert a python object (list, dict, etc.) into a character stream.

### 3.4 UI Design

We have made easy to use UI for every time users. Using HTML5 and CSS3 created 5 pages Index page, about page, checking page, thank you page and Contact Page with connected with MySQL Workbench.

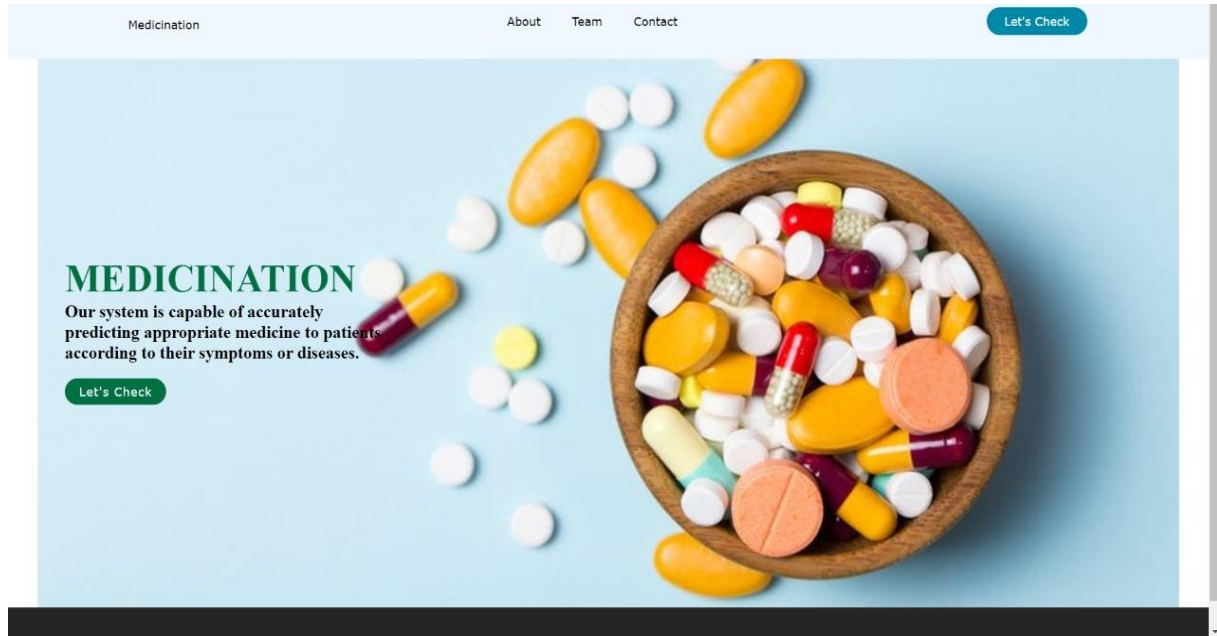


Figure 4: Entry Page of web-site

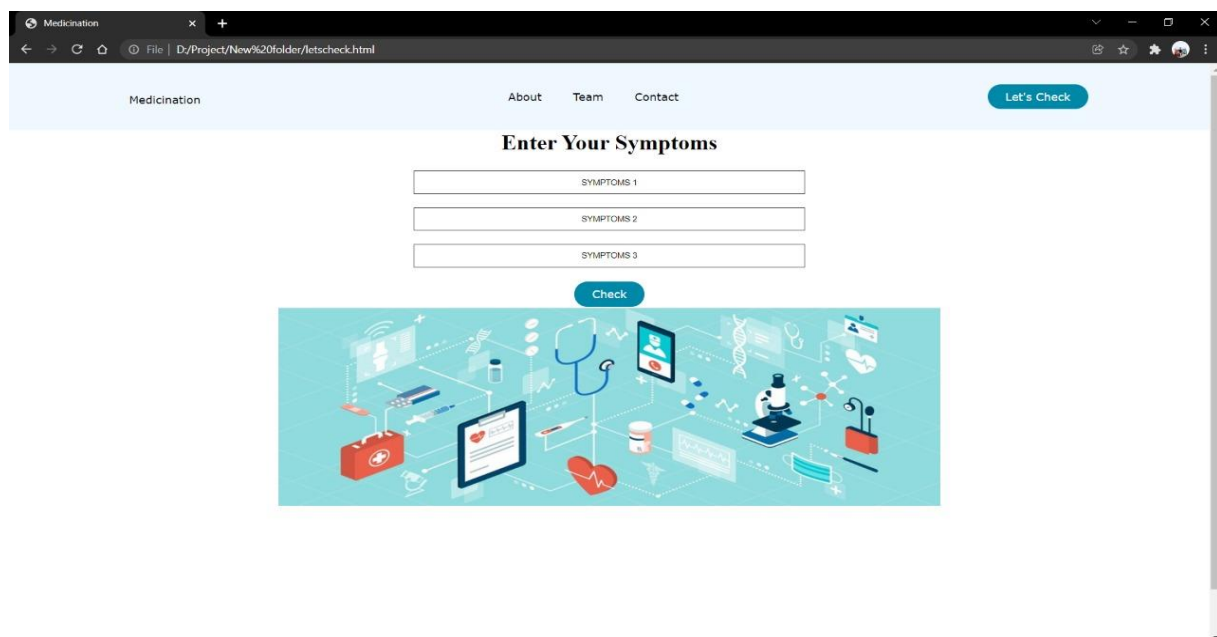


Figure 5: Symptoms Check Page of web-site



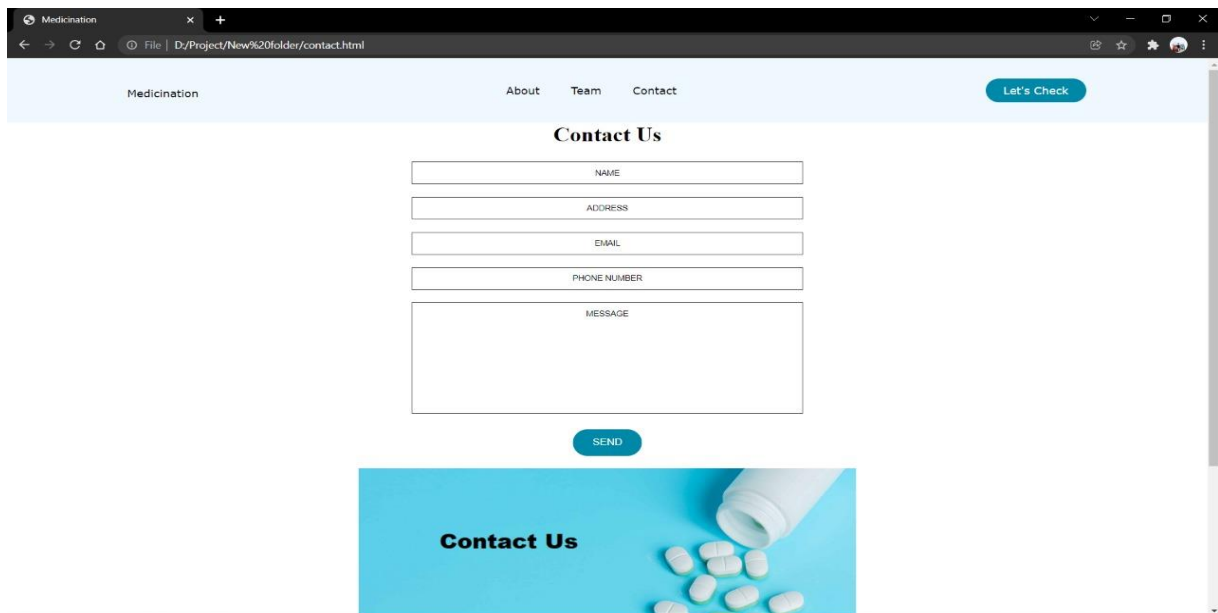


Figure 6: Contact Page of web-site

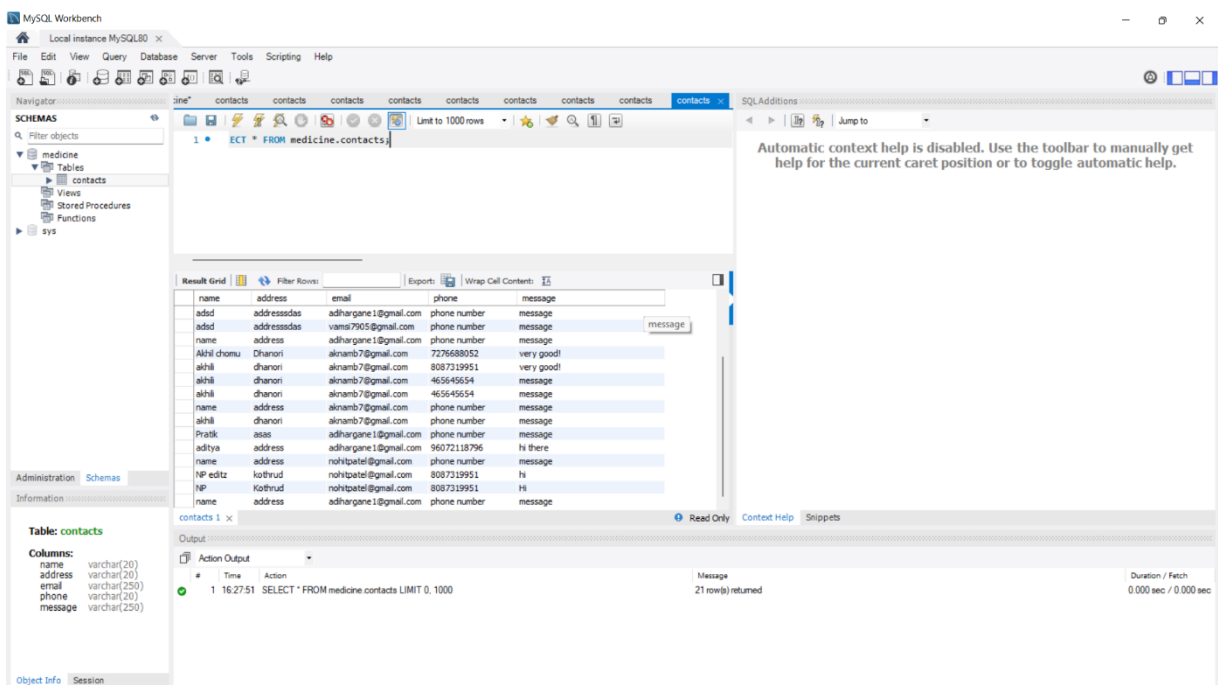


Figure 7: MySQL Workbench

### 3.4 Code

#### 3.4.1 HTML5

##### Index Page

```
<!DOCTYPE html>

<html lang="en">

<head>

    <meta charset="UTF-8">

    <meta http-equiv="X-UA-Compatible" content="IE=edge">

    <meta name="viewport" content="width=device-width, initial-scale=1.0">

    <title>Medication</title>

    <link rel="icon" href="{{ url_for('static',filename='images/icon1.png') }}">

    <link rel="stylesheet" type="text/css" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/5.15.1/css/all.min.css">

    <link rel="stylesheet" type="text/css" href="{{ url_for('static',filename='styles/mainpage.css') }}">

</head>

<body>

    <header>

        <!--  ///jpg logo hide kelay -->

        <h1 class="logo" >

            <a href="{{ url_for('Landing_page') }}">Medication</a>

        </h1>

        <nav>

            <ul class="nav__links">
```

```

        <li><a href="{{ url_for('about_page') }}">About</a></li>

        <li><a href="{{ url_for('team_page') }}">Team</a></li>

        <li><a href="{{ url_for('contact_page') }}">Contact</a></li>

    </ul>

</nav>

<a class="cta" href="{{ url_for('check_page') }}"><button>Let's Check</button></a>

</header>

<div class="frontimg">

    <div class="frontimg_text">

        <h2><span>MEDICATION<br></span>Our system is capable of accurately

        <br>predicting appropriate medicine to patients<br>

        according to their symptoms or diseases.</h2>

        <a href="{{ url_for('check_page') }}">Let's Check</a>

    </div>

</div>

</div>

<footer class="footer">

    <div class="container_foot">

        <div class="row">

            <div class="footer-col">

                <h4>company</h4>

                <ul>

                    <li><a href="{{ url_for('about_page') }}">about us</a></li>

                    <li><a href="{{ url_for('team_page') }}">team</a></li>

                </ul>

```



```

<meta name="viewport" content="width=device-width, initial-scale=1.0">

<title>Medicination</title>

<link rel="icon" href="{{ url_for('static',filename='images/icon1.png') }}">

<link rel="stylesheet" type="text/css" href="https://cdnjs.cloudflare.com/ajax/libs/font-
awesome/5.15.1/css/all.min.css">

<link rel="stylesheet" type="text/css" href="{{
url_for('static',filename='styles/mainpage.css') }}">

</head>

<body>

<header>

<!--  //jpg logo hide kelay -->

<h1 class="logo" >

<a href="{{ url_for('Landing_page') }}">Medicination</a>

</h1>

<nav>

<ul class="nav__links">

<li><a href="{{ url_for('about_page') }}">About</a></li>

<li><a href="{{ url_for('team_page') }}">Team</a></li>

<li><a href="{{ url_for('contact_page') }}">Contact</a></li>

</ul>

</nav>

<a class="cta" href="{{ url_for('check_page') }}"><button>Let's Check</button></a>

</header>

<div id="body_2">

<div class="sect">

<div class="container">

```

```
<div class="title">
```

```
<h1>About Us</h1>
```

```
</div>
```

```
<div class="content">
```

```
<div class="article">
```

```
<h2>
```

OUR AIM

```
</h2>
```

```
<p>
```

To design and implement a system that will recommend medicine according to the symptoms using Machine Learning Python and Flask FrameWork.

```
</p>
```

```
<h2>
```

PROBLEM DEFINATION

```
</h2>
```

```
<p>
```

A vast amount of clinical data scattered across different sites on the Internet hinders users from finding helpful information for their well-being improvement. Besides, the overload of medical information (e.g., on drugs, medical tests, and treatment suggestions) have brought many difficulties to medical professionals in making patient-oriented decisions. These issues raise the need to apply recommender systems in the healthcare domain to help both, end-users and medical professionals, make more efficient and accurate health-related decisions.

```
</p>
```

```
<h2>
```

OBJECTIVE

```
</h2>
```

```
<P>
```

Our review suggests to extend the existing solutions by adding recommendations for the dosage of drugs, as well as building highly scalable solutions.

</P>

<div class="button">

<a href="{{ url\_for('check\_page') }}">Learn More</a>

</div>

</div>

</div>

</div>

</div>

</div>

<footer class="footer">

<div class="container\_foot">

<div class="row">

<div class="footer-col">

<h4>company</h4>

<ul>

<li><a href="{{ url\_for('about\_page') }}">about us</a></li>

<li><a href="{{ url\_for('team\_page') }}">team</a></li>

</ul>

</div>

<div class="footer-col">

<h4>follow us</h4>

<div class="social-links">

<a href="https://www.facebook.com/"><i class="fab fa-facebook-f"></i></a>





```
<link rel="stylesheet" type="text/css" href="{{ url_for('static',filename='styles/mainpage.css') }}">
```

```
</head>
```

```
<body>
```

```
<header>
```

```
<h1 class="logo" >
```

```
<a href="{{ url_for('Landing_page') }}">Medicination</a>
```

```
</h1>
```

```
<nav>
```

```
<ul class="nav__links">
```

```
<li><a href="{{ url_for('about_page') }}">About</a></li>
```

```
<li><a href="{{ url_for('team_page') }}">Team</a></li>
```

```
<li><a href="{{ url_for('contact_page') }}">Contact</a></li>
```

```
</ul>
```

```
</nav>
```

```
<a class="cta" href="{{ url_for('check_page') }}"><button>Let's Check</button></a>
```

```
</header>
```

```
<div id="body">
```

```
<h1>Contact Us</h1>
```

```
<form method='POST' action='/send' >
```

```
<input type="text" name="name" id="name" value="name">
```

```
<input type="text" name="address" id="address" value="address">
```

```
<input type="text" name="email" id="email" value="email">
```

```
<input type="text" name="phone" id="phone" value="phone number">
```

```
<textarea name="message" id="message" value="message">message</textarea>
```

```

        <input type="submit" name="send" id="send" value="send">

    </form>

    <div class="contactimg">

    </div>

</div>

<footer class="footer">

    <div class="container_foot">

        <div class="row">

            <div class="footer-col">

                <h4>company</h4>

                <ul>

                    <li><a href="{{ url_for('about_page') }}">about us</a></li>

                    <li><a href="{{ url_for('team_page') }}">team</a></li>

                </ul>

            </div>

            <div class="footer-col">

                <h4>follow us</h4>

                <div class="social-links">

                    <a href="https://www.facebook.com/"><i class="fab fa-facebook-f"></i></a>

                    <a href="https://twitter.com/adihargane_"><i class="fab fa-twitter"></i></a>

                    <a href="https://instagram.com/the_pratzs_pb7?utm_medium=copy_link"><i
class="fab fa-instagram"></i></a>

                    <a href="https://www.linkedin.com/in/vamsi-avula-390431219/"><i class="fab
fa-linkedin-in"></i></a>

                </div>

```

```

        </div>

    </div>

</div>

</footer>

<div id="footer"></div>

</body>

</html>

```

## Let's Check Page

```

<!DOCTYPE html>

<html lang="en">

<head>

    <meta charset="UTF-8">

    <meta http-equiv="X-UA-Compatible" content="IE=edge">

    <meta name="viewport" content="width=device-width, initial-scale=1.0">

    <title>Medication</title>

    <link rel="icon" href="{ { url_for('static',filename='images/icon1.png') } }">

    <link rel="stylesheet" type="text/css" href="https://cdnjs.cloudflare.com/ajax/libs/font-
awesome/5.15.1/css/all.min.css">

    <link rel="stylesheet" type="text/css" href="{ {
url_for('static',filename='styles/mainpage.css') } }">

</head>

<body>

    <header>

        <!--   ///jpg logo hide kelay -->

```

```

<h1 class="logo" >

    <a href="{{ url_for('Landing_page') }}">Medicination</a>

</h1>

<nav>

    <ul class="nav__links">

        <li><a href="{{ url_for('about_page') }}">About</a></li>

        <li><a href="{{ url_for('team_page') }}">Team</a></li>

        <li><a href="{{ url_for('contact_page') }}">Contact</a></li>

    </ul>

</nav>

<a class="cta" href="{{ url_for('check_page') }}"><button>Let's Check</button></a>

</header>

<div id="body">

    <h1>Enter Your Symptoms</h1>

    <div>

        <form action="/predict" method="post" class="col s12">

            <div class="row">

                <div class="input-field col s4">

                    <label for="s1"><b><h3>Symptom-1</h3></b></label>

                    <input id="s1" name="Symptom1" placeholder="" type="text" class="validate"
list="datalist1">

                    <datalist id="datalist1">

                        <option value="Itching">

                            <option value="Skin rash">

                                <option value="Nodal skin eruptions">

```

<option value="Continuous sneezing">

<option value="Shivering">

<option value="Chills">

<option value="Joint pain">

<option value="Stomach pain">

<option value="Acidity">

<option value="Ulcers on tongue">

<option value="Muscle wasting">

<option value="Vomiting">

<option value="Burning micturition">

<option value="Spotting urination">

<option value="Fatigue ">

<option value="Weight gain">

<option value="Anxiety ">

<option value="Cold hands and feet">

<option value="Weight loss">

<option value="Restlessness ">

<option value="Lethargy ">

<option value="Patches in throat">

<option value="Irregular sugar level">

<option value="Cough ">

<option value="High fever">

<option value="Sunken eyes">

<option value="Breathlessness ">

<option value="Sweating ">

<option value="Dehydration ">  
<option value="Indigestion ">  
<option value="Headache ">  
<option value="Yellowish skin">  
<option value="Dark urine">  
<option value="Nausea ">  
<option value="Loss of appetite">  
<option value="Pain behind the eyes">  
<option value="Back pain">  
<option value="Constipation ">  
<option value="Abdominal pain">  
<option value="Diarrhoea ">  
<option value="Mild fever">  
<option value="Yellow urine">  
<option value="Yellowing of eyes">  
<option value="Acute liver failure">  
<option value="Fluid overload">  
<option value="Swelling of stomach">  
<option value="Swelled lymph nodes">  
<option value="Malaise ">  
<option value="Blurred and distorted vision">  
<option value="Phlegm ">  
<option value="Throat irritation">  
<option value="Redness of eyes">  
<option value="Sinus pressure">

<option value="Runny nose">  
<option value="Congestion ">  
<option value="Chest pain">  
<option value="Weakness in limbs">  
<option value="Fast heart rate">  
<option value="Pain during bowel movements">  
<option value="Pain in anal region">  
<option value="Bloody stool">  
<option value="Irritation in anus">  
<option value="Neck pain">  
<option value="Dizziness ">  
<option value="Cramps ">  
<option value="Bruising ">  
<option value="Obesity ">  
<option value="Swollen legs">  
<option value="Swollen blood vessels">  
<option value="Puffy face and eyes">  
<option value="Enlarged thyroid">  
<option value="Brittle nails">  
<option value="Swollen extremities">  
<option value="Excessive hunger">  
<option value="Extra marital contacts">  
<option value="Drying and tingling lips">  
<option value="Slurred speech">  
<option value="Knee pain">

<option value="Hip joint pain">  
<option value="Muscle weakness">  
<option value="Stiff neck">  
<option value="Swelling joints">  
<option value="Movement stiffness">  
<option value="Spinning movements">  
<option value="Loss of balance">  
<option value="Unsteadiness ">  
<option value="Weakness of one body side">  
<option value="Loss of smell">  
<option value="Bladder discomfort">  
<option value="Foul smell of urine">  
<option value="Continuous feel of urine">  
<option value="Passage of gases">  
<option value="Internal itching">  
<option value="Toxic look (typhus)">  
<option value="Depression">  
<option value="Irritability ">  
<option value="Muscle pain">  
<option value="Altered sensorium">  
<option value="Red spots over body">  
<option value="Belly pain">  
<option value="Abnormal menstruation">  
<option value="Dyschromic patches">  
<option value="Watering from eyes">



<option value="Increased appetite">

<option value="Polyuria ">

<option value="Family history">

<option value="Mucoid sputum">

<option value="Rusty sputum">

<option value="Lack of concentration">

<option value="Visual disturbances">

<option value="Receiving blood transfusion">

<option value="Receiving unsterile injections">

<option value="Coma">

<option value="Stomach bleeding">

<option value="Distention of abdomen">

<option value="History of alcohol consumption">

<option value="Fluid overload">

<option value="Blood in sputum">

<option value="Prominent veins on calf">

<option value="Palpitations">

<option value="Painful walking">

<option value="Pus filled pimples">

<option value="Blackheads">

<option value="Scarring">

<option value="Skin peeling">

<option value="Silver like dusting">

<option value="Small dents in nails">

<option value="Inflammatory nails">

<option value="Blister">

<option value="Red sore around nose">

<option value="Yellow crust ooze">

</datalist>

</div>

<div class="input-field col s4">

<label for="s2"> <b><h3>Symptom-2</h3></b></label>

<input id="s2" name="Symptom2" placeholder="" type="text" class="validate"  
list="datalist2">

<datalist id="datalist2">

<option value="Skin rash">

<option value="Nodal skin eruptions">

<option value="Continuous sneezing">

<option value="Shivering">

<option value="Chills">

<option value="Joint pain">

<option value="Stomach pain">

<option value="Acidity">

<option value="Ulcers on tongue">

<option value="Muscle wasting">

<option value="Vomiting">

<option value="Burning micturition">

<option value="Spotting urination">

<option value="Fatigue ">

<option value="Weight gain">

<option value="Anxiety ">  
<option value="Cold hands and feet">  
<option value="Weight loss">  
<option value="Restlessness ">  
<option value="Lethargy ">  
<option value="Patches in throat">  
<option value="Irregular sugar level">  
<option value="Cough ">  
<option value="High fever">  
<option value="Sunken eyes">  
<option value="Breathlessness ">  
<option value="Sweating ">  
<option value="Dehydration ">  
<option value="Indigestion ">  
<option value="Headache ">  
<option value="Yellowish skin">  
<option value="Dark urine">  
<option value="Nausea ">  
<option value="Loss of appetite">  
<option value="Pain behind the eyes">  
<option value="Back pain">  
<option value="Constipation ">  
<option value="Abdominal pain">  
<option value="Diarrhoea ">  
<option value="Mild fever">

<option value="Yellow urine">

<option value="Yellowing of eyes">

<option value="Acute liver failure">

<option value="Fluid overload">

<option value="Swelling of stomach">

<option value="Swelled lymph nodes">

<option value="Malaise ">

<option value="Blurred and distorted vision">

<option value="Phlegm ">

<option value="Throat irritation">

<option value="Redness of eyes">

<option value="Sinus pressure">

<option value="Runny nose">

<option value="Congestion ">

<option value="Chest pain">

<option value="Weakness in limbs">

<option value="Fast heart rate">

<option value="Pain during bowel movements">

<option value="Pain in anal region">

<option value="Bloody stool">

<option value="Irritation in anus">

<option value="Neck pain">

<option value="Dizziness ">

<option value="Cramps ">

<option value="Bruising ">

<option value="Obesity ">  
<option value="Swollen legs">  
<option value="Swollen blood vessels">  
<option value="Puffy face and eyes">  
<option value="Enlarged thyroid">  
<option value="Brittle nails">  
<option value="Swollen extremities">  
<option value="Excessive hunger">  
<option value="Extra marital contacts">  
<option value="Drying and tingling lips">  
<option value="Slurred speech">  
<option value="Knee pain">  
<option value="Hip joint pain">  
<option value="Muscle weakness">  
<option value="Stiff neck">  
<option value="Swelling joints">  
<option value="Movement stiffness">  
<option value="Spinning movements">  
<option value="Loss of balance">  
<option value="Unsteadiness ">  
<option value="Weakness of one body side">  
<option value="Loss of smell">  
<option value="Bladder discomfort">  
<option value="Foul smell of urine">  
<option value="Continuous feel of urine">

<option value="Passage of gases">

<option value="Internal itching">

<option value="Toxic look (typhus)">

<option value="Depression">

<option value="Irritability ">

<option value="Muscle pain">

<option value="Altered sensorium">

<option value="Red spots over body">

<option value="Belly pain">

<option value="Abnormal menstruation">

<option value="Dyschromic patches">

<option value="Watering from eyes">

<option value="Increased appetite">

<option value="Polyuria ">

<option value="Family history">

<option value="Mucoid sputum">

<option value="Rusty sputum">

<option value="Lack of concentration">

<option value="Visual disturbances">

<option value="Receiving blood transfusion">

<option value="Receiving unsterile injections">

<option value="Coma">

<option value="Stomach bleeding">

<option value="Distention of abdomen">

<option value="History of alcohol consumption">

<option value="Fluid overload">  
<option value="Blood in sputum">  
<option value="Prominent veins on calf">  
<option value="Palpitations">  
<option value="Painful walking">  
<option value="Pus filled pimples">  
<option value="Blackheads">  
<option value="Scarring">  
<option value="Skin peeling">  
<option value="Silver like dusting">  
<option value="Small dents in nails">  
<option value="Inflammatory nails">  
<option value="Blister">  
<option value="Red sore around nose">  
<option value="Yellow crust ooze">

</datalist>

</div>

<div class="input-field col s4">

<label for="s3"><b><h3>Symptom-3</h3></b></label>

<input id="s3" name="Symptom3" placeholder="" type="text" class="validate"  
list="datalist3">

<datalist id="datalist3">

<option value="Itching">

<option value="Skin rash">

<option value="Nodal skin eruptions">

<option value="Continuous sneezing">

<option value="Shivering">

<option value="Chills">

<option value="Joint pain">

<option value="Stomach pain">

<option value="Acidity">

<option value="Ulcers on tongue">

<option value="Muscle wasting">

<option value="Vomiting">

<option value="Burning micturition">

<option value="Spotting urination">

<option value="Fatigue ">

<option value="Weight gain">

<option value="Anxiety ">

<option value="Cold hands and feet">

<option value="Weight loss">

<option value="Restlessness ">

<option value="Lethargy ">

<option value="Patches in throat">

<option value="Irregular sugar level">

<option value="Cough ">

<option value="High fever">

<option value="Sunken eyes">

<option value="Breathlessness ">

<option value="Sweating ">



<option value="Dehydration ">  
<option value="Indigestion ">  
<option value="Headache ">  
<option value="Yellowish skin">  
<option value="Dark urine">  
<option value="Nausea ">  
<option value="Loss of appetite">  
<option value="Pain behind the eyes">  
<option value="Back pain">  
<option value="Constipation ">  
<option value="Abdominal pain">  
<option value="Diarrhoea ">  
<option value="Mild fever">  
<option value="Yellow urine">  
<option value="Yellowing of eyes">  
<option value="Acute liver failure">  
<option value="Fluid overload">  
<option value="Swelling of stomach">  
<option value="Swelled lymph nodes">  
<option value="Malaise ">  
<option value="Blurred and distorted vision">  
<option value="Phlegm ">  
<option value="Throat irritation">  
<option value="Redness of eyes">  
<option value="Sinus pressure">

<option value="Runny nose">  
<option value="Congestion ">  
<option value="Chest pain">  
<option value="Weakness in limbs">  
<option value="Fast heart rate">  
<option value="Pain during bowel movements">  
<option value="Pain in anal region">  
<option value="Bloody stool">  
<option value="Irritation in anus">  
<option value="Neck pain">  
<option value="Dizziness ">  
<option value="Cramps ">  
<option value="Bruising ">  
<option value="Obesity ">  
<option value="Swollen legs">  
<option value="Swollen blood vessels">  
<option value="Puffy face and eyes">  
<option value="Enlarged thyroid">  
<option value="Brittle nails">  
<option value="Swollen extremities">  
<option value="Excessive hunger">  
<option value="Extra marital contacts">  
<option value="Drying and tingling lips">  
<option value="Slurred speech">  
<option value="Knee pain">

<option value="Hip joint pain">

<option value="Muscle weakness">

<option value="Stiff neck">

<option value="Swelling joints">

<option value="Movement stiffness">

<option value="Spinning movements">

<option value="Loss of balance">

<option value="Unsteadiness ">

<option value="Weakness of one body side">

<option value="Loss of smell">

<option value="Bladder discomfort">

<option value="Foul smell of urine">

<option value="Continuous feel of urine">

<option value="Passage of gases">

<option value="Internal itching">

<option value="Toxic look (typhus)">

<option value="Depression">

<option value="Irritability ">

<option value="Muscle pain">

<option value="Altered sensorium">

<option value="Red spots over body">

<option value="Belly pain">

<option value="Abnormal menstruation">

<option value="Dyschromic patches">

<option value="Watering from eyes">

<option value="Increased appetite">

<option value="Polyuria ">

<option value="Family history">

<option value="Mucoid sputum">

<option value="Rusty sputum">

<option value="Lack of concentration">

<option value="Visual disturbances">

<option value="Receiving blood transfusion">

<option value="Receiving unsterile injections">

<option value="Coma">

<option value="Stomach bleeding">

<option value="Distention of abdomen">

<option value="History of alcohol consumption">

<option value="Fluid overload">

<option value="Blood in sputum">

<option value="Prominent veins on calf">

<option value="Palpitations">

<option value="Painful walking">

<option value="Pus filled pimples">

<option value="Blackheads">

<option value="Scarring">

<option value="Skin peeling">

<option value="Silver like dusting">

<option value="Small dents in nails">

<option value="Inflammatory nails">

```
        <option value="Blister">

        <option value="Red sore around nose">

        <option value="Yellow crust ooze">

    </datalist>

</div>

</div>

<div class="center">

    <button    type="submit"    type="submit"    name="send"    id="send"
value="Check">Predict</button>

</div>

</form>

</div>

<br>

<br>

<br>

    {{pred}}

    <br>

</div>

</div>

</div>

</div>

<div class="container_foot">

    <div class="row">

        <div class="footer-col">
```

<h4>company</h4>

<ul>

<li><a href="{ { url\_for('about\_page') } }">about us</a></li>

<li><a href="{ { url\_for('team\_page') } }">team</a></li>

</ul>

</div>

<div class="footer-col">

<h4>follow us</h4>

<div class="social-links">

<a href="https://www.facebook.com/"><i class="fab fa-facebook-f"></i></a>

<a href="https://twitter.com/adihargane\_"><i class="fab fa-twitter"></i></a>

<a href="https://instagram.com/the\_pratzs\_pb7?utm\_medium=copy\_link"><i class="fab fa-instagram"></i></a>

<a href="https://www.linkedin.com/in/vamsi-avula-390431219/"><i class="fab fa-linkedin-in"></i></a>

</div>

</div>

</div>

</div>

</footer>

<div id="footer">

</div>

</body>

</html>

### 3.4.2 CSS

```
* {  
  
  box-sizing: border-box;  
  
  margin: 0;  
  
  padding: 0;  
  
}  
  
li, a {  
  
  font-family: Verdana, Geneva, Tahoma, sans-serif;  
  
  font-weight: 500;  
  
  font-size: 16px;  
  
  color: rgb(0, 0, 0);  
  
  text-decoration: none;  
  
}  
  
button {  
  
  font-family: Verdana, Geneva, Tahoma, sans-serif;  
  
  font-weight: 500;  
  
  font-size: 16px;  
  
  color: rgb(255, 255, 255);  
  
  text-decoration: none;  
  
}  
  
header {  
  
  display: flex;  
  
  justify-content: space-between;  
  
  align-items: center;
```

```
padding: 30px 10%;

background : aliceblue;

}

.logo {

    cursor: pointer;

}

.nav__links {

    list-style: none;

    /* background: black;

    height: 100px; */

}

.nav__links li {

    display: inline-block;

    padding: 0px 20px;

}

.nav__links li a {

    transition: all 0.3s ease 0s;

}

.nav__links li a:hover {

    color: #0088a9;

}

button {

    margin : 2px;

    padding: 9px 25px;

    background-color: rgba(0, 136, 169, 1);
```



```
border: none;

border-radius: 50px;

cursor: pointer;

transition: all 0.3s ease 0s;

}

button:hover {

background-color: rgba(0, 136, 169, 0.8);

}

.frontimg{

position: relative;

}

.frontimg img {

display: block;

margin-left: auto;

margin-right: auto;

width: 95%;

}

.frontimg_text{

position :absolute;

top : 25%;

color : black;

padding : 80px;

}

.frontimg_text h2{

color: #333;
```

```
font-size: 2.2em;    /*original 4 */

line-height: 1.4em;

font-weight: 600;    /*original 900*/
}

.frontimg_text h2 span{

color: #017143;

font-size: 2.2em;    /*original 1.2*/

font-weight: 900;

}

.frontimg_text a{

display: inline-block;

margin-top: 20px;

padding: 8px 20px;

background: #017143;

color: #fff;

border-radius: 40px;

font-weight: 500;

letter-spacing: 1px;

text-decoration: none;

}

.frontimg_text a:hover{

background-color: rgba(0, 136, 169, 0.8);

}

#body {

margin: 0;
```

```
padding: 0 0 200px;

text-align: center;

}

#body_2 {

margin: 0;

padding: 0 0 100px;

text-align: center;

}

#body form {

margin: 0 auto;

padding: 24px 0 0;

width: 620px;

}

#body form input, #body form textarea {

border: 1px solid #252525;

color: #000000;

font-family: Arial, Helvetica, sans-serif;

font-size: 12px;

font-weight: normal;

margin: 0 0 20px;

padding: 10px;

text-align: center;

text-transform: uppercase;

width: 550px;

}
```

```
#body form textarea {  
    height: 175px;  
    overflow: auto;  
    resize: none;  
}  
.checking img{  
    width: auto;  
}  
#body form #send {  
    color: #fff;  
    font-size: 15px;  
    font-weight: 300;  
    display: inline-block;  
    padding: 12px 28px;  
    width: auto;  
    background-color: rgba(0, 136, 169, 1);  
    border: none;  
    border-radius: 50px;  
    cursor: pointer;  
    transition: all 0.3s ease 0s;  
}  
#body form #send:hover{  
    background-color: rgba(0, 136, 169, 0.8);  
}
```

```
.sect{  
    width: 100%;  
}  
  
.sect .container{  
    width: 80%;  
    display: block;  
    margin: 0px auto;  
    padding: 50px 0px;  
}  
  
.container .title{  
    width: 100%;  
    text-align: center;  
    margin-bottom: 50px;  
}  
  
.container .title h1{  
    text-transform: uppercase;  
    font-size: 35px;  
    color: black;  
}  
  
.content{  
    /* float: centre; */  
    display: block;  
    margin-left: auto;  
    margin-right: auto;
```

```
width: 55%;  
  
}  
  
.image-section{  
  
    float: right;  
  
    width: 40%;  
  
}  
  
.image-section img{  
  
    width: 100%;  
  
    height: auto;  
  
}  
  
.content .article h2{  
  
    color: #a3a3a3;  
  
    font-size: 17px;  
  
}  
  
.content .article p{  
  
    margin-top: 20px;  
  
    margin-bottom : 20px;  
  
    font-size: 16px;  
  
    line-height: 1.5;  
  
    color: #333;  
  
}  
  
.content .article .button{  
  
    margin-top: 50px;  
  
}  
  
.content .article .button a{
```

```
text-decoration: none;

padding: 8px 25px;

background-color: rgba(0, 136, 169, 1);

border-radius: 40px;

color: #fff;

font-size: 18px;

letter-spacing: 1.5px;

}
```

```
.content .article .button a:hover{

color: #fff;

background-color: #f28ff2;

transition: 1s ease;

}
```

```
.container_foot{

max-width: 1170px;

margin:auto;

}
```

```
.row{

display: flex;

flex-wrap: wrap;

}
```

```
ul{

list-style: none;

}
```

```
.footer{
```

```
background-color: #24262b;
```

```
padding: 70px 0;
```

```
}
```

```
.footer-col{
```

```
width: 25%;
```

```
padding: 0 15px;
```

```
}
```

```
.footer-col h4{
```

```
font-size: 18px;
```

```
color: #ffffff;
```

```
text-transform: capitalize;
```

```
margin-bottom: 35px;
```

```
font-weight: 500;
```

```
position: relative;
```

```
}
```

```
.footer-col h4::before{
```

```
content: ";
```

```
position: absolute;
```

```
left:0;
```

```
bottom: -10px;
```

```
background-color: #e91e63;
```

```
height: 2px;
```

```
box-sizing: border-box;
```

```
width: 50px;
```

```
}
```



```
.footer-col ul li:not(:last-child){  
  
margin-bottom: 10px;  
  
}  
  
.footer-col ul li a{  
  
font-size: 16px;  
  
text-transform: capitalize;  
  
color: #ffffff;  
  
text-decoration: none;  
  
font-weight: 300;  
  
color: #bbbbbb;  
  
display: block;  
  
transition: all 0.3s ease;  
  
}  
  
.footer-col ul li a:hover{  
  
color: #ffffff;  
  
padding-left: 8px;  
  
}  
  
.footer-col .social-links a{  
  
display: inline-block;  
  
height: 40px;  
  
width: 40px;  
  
background-color: rgba(255,255,255,0.2);  
  
margin:0 10px 10px 0;  
  
text-align: center;  
  
line-height: 40px;
```

```
border-radius: 50%;  
  
color: #ffffff;  
  
transition: all 0.5s ease;  
  
}  
  
.footer-col .social-links a:hover{  
  
color: #24262b;  
  
background-color: #ffffff;  
  
}
```

### **3.4.3 Python Code**

#### **Disease.py**

```
import pandas as pd  
  
import numpy as np  
  
import seaborn as sns  
  
import matplotlib.pyplot as plt  
  
import pickle  
  
  
test=pd.read_csv("test_data.csv",error_bad_lines=False)  
  
train=pd.read_csv("training_data.csv",error_bad_lines=False)  
  
  
test.head()  
  
train.head()  
  
train.info()  
  
train=train.drop('Unnamed: 133',axis=1)
```

```
train.head()
```

```
y_train=train.prognosis
```

```
x_train=train.drop('prognosis',axis=1)
```

```
x_train
```

```
y_train
```

```
y_test=test.prognosis
```

```
x_test=test.drop('prognosis',axis=1)
```

```
x_test.head()
```

```
y_test.head()
```

```
f,ax = plt.subplots(figsize=(75,16))
```

```
sns.countplot(y_train,label="Count",ax=ax)
```

```
from sklearn.model_selection import train_test_split
```

```
from sklearn.ensemble import RandomForestClassifier
```

```
from sklearn.metrics import accuracy_score
```

```
clf_rf = RandomForestClassifier(random_state=43)
```

```
clr_rf = clf_rf.fit(x_train,y_train)
```

```
ac = accuracy_score(y_test,clf_rf.predict(x_test))
```

```
print('Accuracy is: ',ac)
```

```
pickle.dump(clf_rf,open('model.pkl','wb'))
```

```
col=x_train.columns
```

```
type(col)
```

```
len(col)
```

```
inputt = "itching stomach_pain skin_rash".split(' ')
```

```
inputt
```

```
b=[0]*len(col)
```

```
for x in range(0,132):
```

```
    for y in inputt:
```

```
        if(col[x]==y):
```

```
            b[x]=1
```

```
b=np.array(b)
```

```
b=b.reshape(1,132)
```

```
sol=clf_rf.predict(b)
```

```
sol
```

### **Application.py**

```
from os import name
```

```
from flask import Flask, render_template, request
```

```
from flask_mysqlldb import MySQL
```

```
import pandas as pd
```

```
import numpy as np

import pickle

from flask_mail import Mail, Message


application= Flask(__name__)

model = pickle.load(open('model.pkl', 'rb'))


test=pd.read_csv("test_data.csv",error_bad_lines=False)

x_test=test.drop('prognosis',axis=1)


application.config['MYSQL_HOST'] = 'localhost'

application.config['MYSQL_USER'] = 'root'

application.config['MYSQL_PASSWORD'] = '@Xspax_@1'

application.config['MYSQL_DB'] = 'medicine'


mysql = MySQL(application)


mail = Mail(application) # instantiate the mail class


# configuration of mail

application.config['MAIL_SERVER']='smtp.gmail.com'

application.config['MAIL_PORT'] = 465

application.config['MAIL_USERNAME'] = 'medication1@gmail.com'

application.config['MAIL_PASSWORD'] = 'Medicine@1234'
```

```
application.config['MAIL_USE_TLS'] = False
```

```
application.config['MAIL_USE_SSL'] = True
```

```
mail = Mail(application)
```

```
@application.route('/')
```

```
def Landing_page():
```

```
    return render_template('index.html')
```

```
@application.route('/check')
```

```
def check_page():
```

```
    return render_template('letscheck.html')
```

```
@application.route('/about')
```

```
def about_page():
```

```
    return render_template('about.html')
```

```
@application.route('/team')
```

```
def team_page():
```

```
    return render_template('team.html')
```

```
@application.route('/contact')
```

```
def contact_page():
```

```
    return render_template('contact.html')
```

```
@application.route('/send', methods =['GET','POST' ] )
```

```
def send( ):
```

```
    if request.method=='POST':
```

```
        name = request.form['name']
```

```
        address = request.form['address']
```

```
        email = request.form['email']
```

```
        phone = request.form['phone']
```

```
        message = request.form['message']
```

```
        cur=mysql.connection.cursor()
```

```
        cur.execute(" INSERT INTO contacts(name, address, email, phone, message) VALUES(
%s, %s, %s, %s, %s )", (name, address, email, phone, message) )
```

```
        mysql.connection.commit()
```

```
        cur.close()
```

```
        msg = Message(
```

```
            'Medicine ',
```

```
            sender ='medication1@gmail.com',
```

```
            recipients = [email]
```

```
        )
```

```
        msg.html = render_template('mail.html')
```

```
        mail.send(msg)
```

```
    return render_template('ThankYou.html')
```

```
return render_template('contact.html')
```

```
@application.route('/predict',methods=['POST','GET'])
```

```
def predict():
```

```
    if request.method=='POST':
```

```
        col=x_test.columns
```

```
        inputt = [str(x) for x in request.form.values()]
```

```
        b=[0]*132
```

```
        for x in range(0,132):
```

```
            for y in inputt:
```

```
                if(col[x]==y):
```

```
                    b[x]=1
```

```
        b=np.array(b)
```

```
        b=b.reshape(1,132)
```

```
        prediction = model.predict(b)
```

```
        prediction=prediction[0]
```

```
        print(prediction)
```

```
    return render_template('letscheck.html', pred="The probable diagnosis says it could be  
{ }".format(prediction))
```

```
if __name__=="__main__":
```

```
    application.run(debug=True,port=8000)
```



## CHAPTER 4

### Result

#### 4.1 Result

The model trained on 132 symptoms and 42 diseases and its respective medicines. From the below table, we can infer that all the three algorithm shows excellent result but Naive Bayes performs the best and achieve the highest accuracy of 98.12 percentage. The training accuracy has been described in below table. As we can see that the efficiency of training is higher in Naïve Based classifier. It is because it overcomes the problem of overfitting, which is common in the case of Decision Tree and Random Forest classifiers.

Once all these classifiers are trained, now it is ready for testing the results over any symptoms. In the process of implementing the system, Web-Site also been developed so that this work can be used as a software product version. User can select the symptoms which trained in model. Now based on the specified symptoms our system can predict the disease as well as the recommended drug for curing it.

<i>Algorithm used</i>	<i>Accuracy</i>
<i>Decision Tree</i>	<i>0.9763</i>
<i>Random Forest</i>	<i>0.9763</i>
<i>Naïve Bayes</i>	<i>0.9812</i>

*Table 2: Algorithms and accuracy*

Medication About Team Contact Let's Check

## Enter Your Symptoms

Symptom-1  
THROAT\_IRRITATION

Symptom-2  
REDNESS\_OF\_EYES

Symptom-3  
RUNNY\_NOSE

Predict

The probable diagnosis says it could be Common Cold use Azee or Monticope

Figure 8: Result 1

Medication About Team Contact Let's Check

## Enter Your Symptoms

Symptom-1  
CHEST PAIN

Symptom-2  
ULCERS ON TONGUE

Symptom-3  
ACIDITY

Predict

The probable diagnosis says it could be GERD use PantoDSR

Figure 9: Result 2

## CHAPTER 5

### Conclusion and Future Scope

In this work a disease prediction and medicine recommendation system has been developed using various machine learning algorithms like Naïve Bayes, Decision Tree and Random Forest. The system has been trained by mapping the various symptoms of the diseases in the dataset. Disease prediction level (High, Average and Low) has also been analyzed based on the classify by the different classifiers. Moreover, our system also recommends the suitable medicine for the predicted diseases.

Now we set out to create a system which can predict disease and its medicine on the basis of symptoms given to it. On average we achieved accuracy of ~98%. System has an easy-to-use interface so anyone can use very easily. It will decrease the work load of doctors.

*This system is only a temporary solution, it can be used in emergencies like when there is no one to consult. Someone who don't want waste time to visiting a doctor for minor symptoms.*

## Reference

- 1) Satvik Garg Department of Computer science Jaypee University of Information Technology Solan, India 2021.
- 2) T. Venkat Narayana Rao, Anjum Unisa, Kotha Sreni TERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 9, ISSUE 02, FEBRUARY 2020.
- 3) Benjamin Stark<sup>1</sup>, Constanze Knahl<sup>2</sup>, Mert Aydin<sup>3</sup>, Karim Elish<sup>4</sup> Department of Computer Science, Florida Polytechnic University, Lakeland, US 2019.
- 4) Sonak Chowdhury Deepak kumar 2019.
- 5) Masic I, Ferhatovica A. Review of Most Important Biomedical Databases for Searching of Biomedical Scientific Literature. Donald School J Ultrasound Obstet Gynecol 2012; 6 (4):343-361.
- 6) Rekha Nagar , Yudhvir Singh International journal of Emerging Technologies and Innovative Research ([www.jetir.org/](http://www.jetir.org/)), ISSN:2349-5162. Vol.6 Issue 4, page no 471-474, April 2019.
- 7) Binu Thomas and Amruth K John 2021 IOP Conf. Ser.: Mater. Sci. Eng. 1085 012011, 2019.
- 8) David R. Cheriton School of Computer Science University of Waterloo, ON, Canada [iportugal@uwaterloo.ca](mailto:iportugal@uwaterloo.ca) 2019.
- 9) Bao, Y. and Jiang, X. 2016. An Intelligent Medicine Recommender System Framework. 2016 IEEE 11th Conference on Industrial Electronics and Applications (ICIEA).
- 10) Varun A. Goyal<sup>1</sup>, Dilip J. Parmar<sup>2</sup>, Namaskar I. Joshi<sup>3</sup>, Prof. Komal Champanerkar<sup>4</sup> 1,2,3Department of Information Technology, Shree L.R. Tiwari College of Engineering, Maharashtra, India
- 11) Doulaverakis, c., Nikolaidis, G., Kleontas, A., and Kompatsiaris, I. 2012. GalenOWL: Ontology-based drug recommendations discovery. Journal of Biomedical Semantics 3, 14.
- 12) Shraddha Gupta 2Under Guidance of Assistance Professor, Ankit Maithani, Department of CSE, DBGI Dehradun, India e-ISSN: 2395-0056, Volume: 07 Issue: 09 | Sep 2020.
- 13) F. Furtado\* , A, Singh (2020). Movie Recommendation System Using Machine Learning Int. J. Res. Ind. Eng 9(1) (2020) 84-98
- 14) Recommendation system using Machine Learning Suhasini Parvatikar Computer Engineering, Assistant Professor SCOE, Kharghar, India
- 15) The Use of Machine Learning Algorithms in Recommender Systems Donald Cowan,

Paulo Alencar, Ivens Portugal David R. Cheriton School of Computer Science  
University of Waterloo, ON, Canada [iportugal@uwaterloo.ca](mailto:iportugal@uwaterloo.ca) June 2016.

- 16) Azhar Susanto, Meiryani Database Management System INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 8, ISSUE 06, JUNE 2019.
- 17) Evaristus Didik Madyatmadja, Chelsea Adora Information Systems Department, School of Information Systems, Bina Nusantara University, 11480, Indonesia ISSN: 2415-669812 December 2019.
- 18) Ayantika Nath, Shikha Nema Clustering Visualization and Class Prediction using Flask of Benchmark Dataset for Unsupervised Techniques in Machine learning ISSN: 2278-3075, Volume-9 Issue-7, May 2020.