Medicine Recommend System Using Machine Learning

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ABSTRACT

Most 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 people do not know about medicines and to visit a doctor and consult for minor symptoms for medicines is a time-consuming process. AI and machine learning like emerging technology can help us to create a recommended system that will prescribe medicine and this system can accurately predict a medicine to use. In this paper proposes the medicine recommendation system which will predict disease and medicine according to symptoms entered by patients/users.

Keywords: Recommendation system, Machine learning, Medicine, Healthcare

I. INTRODUCTION

Nowadays, people are busy in their day-to-day life, and it is not feasible for everyone to visit a doctor for minor symptoms of a disease. Visiting a hospital is a time-consuming process. Since Covid-19 pandemic has started, inaccessibility of clinical resources is at its peak, like the shortage of doctors and healthcare workers, lack of medical equipment and medicines etc. The entire medical ecosystem is in distress, which results in numerous individual's demise. Due to unavailability of doctors, many people started taking medication independently without consultation, it makes the health condition worse than usual. Precision medicine plays an important role to provide quality treatment and individually care for each patient. Now as the era of Artificial intelligence (AI) comes into existence the area of computer applications gets significantly boosted up. The concept of artificial intelligence is nothing but the simulation of human intelligence processed in computers. The development of artificial intelligence 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 intelligence are based on the accuracy of machine learning algorithms. The accuracy of machine learning algorithms is mainly based on the availability of a significant training dataset. Nowadays, we have enormous data for training a system. In this work, we are trying to analyze data and to build a Machine Learning based system that can suggest the medicine according to the symptoms that are entered by the user.

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 [1]. One of the most concerned and searched topics on the internet is about health information. According to the Pew Internet and American Life Project, almost 60% of grownups are looking for enough health information on the web with 35% of respondents concentrating on diagnosing ailments online only [2]. 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 [3]. Machine Learning (ML) has unfolded from Artificial Intelligence, a field of computer science. Machine Learning (ML) is a multidisciplinary field, a combination of statistics and computer science algorithms which is widely used in predictive analyses and classification [4]. 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 develop such recommendation systems which can lead to more concise decisions [5]. Due to the increase of data on the internet, there is an increased dependency on the internet by people. Thus, recommendation systems help people by suggesting products where there is an overload of information on ecommerce websites [6].

As more people are caring about the health and medical diagnosis problems here, we decided to focus in this area and to create something which would help the people in this field so we thought to create a website through which the user as well as the doctor will be able to search for the different options of medicines. Medicine Recommender System. It will also help chemists or nurses to recommend a medicine in the absence of a doctor. The basic aim of the Medicine Recommendation System is to design an effective and accurate system for predicting proper medication for patients. As a large amount of historical data is available, our system aims to exploit this data and make it useful for society. Our system will analyze the data and suggest accurate medicines to users.

II. Methodology

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 is that based on the symptoms, in many cases, the 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 ways to obtain more accurate predictions. if all classifiers are predicting the different diseases, then final prediction is considered on the basis of Naïve Bayes classifier. Because, a Naïve based classifier gives more accuracy and also it doesn't have the problem of overfitting.

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

Table: Final prediction & level of prediction of diseases
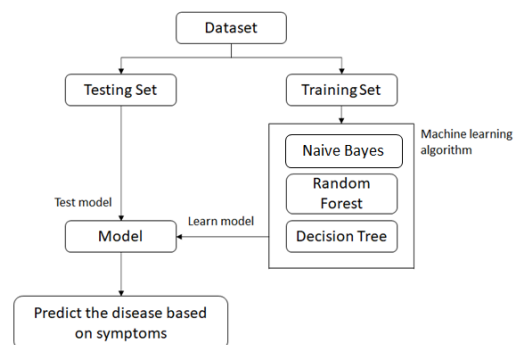
Block diagram of Machine Learning Model
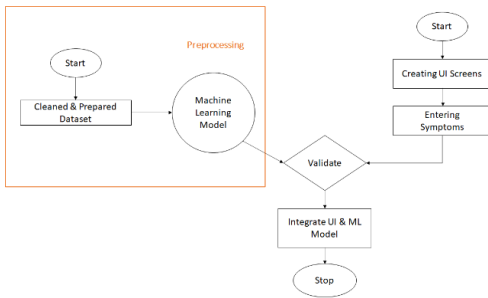
Block diagram of system

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 and resembles 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 are decision nodes and leaf nodes.

· Decision node:

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

· Leaf node: The nodes from which there are 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 correspond to the leaf nodes.

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 a 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.

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 problems which have 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.

III. 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 algorithms show excellent results but Naive Bayes performs the best and achieves the highest accuracy of 98.12 percent. The training accuracy has been described in the table below. As we can see that the efficiency of training is higher in Naïve Based classifiers. It is because it overcomes the problem of overfitting, which is common in the case of Decision Tree and Random Forest classifiers. We have seen that there are many diseases that share common medicines for treatment, if symptoms are common between the diseases. So, the algorithm finds the most common disease then suggests the medicine to the user.

Algorithm used	Accuracy
Decision Tree	0.9763
Random Forest	0.9763
Naïve Bayes	0.9812

Table of algorithms and accuracy

Once all these classifiers are trained, now it is ready for testing the results over any symptoms. In the process of implementing the system, a Web-Site was also developed so that this work can be used as a software product version. Users can select the symptoms (Image1) which are trained in the model. Now based on the specified symptoms our system can predict the disease as well as the recommended drug for curing it (Image 2 & Image 3).
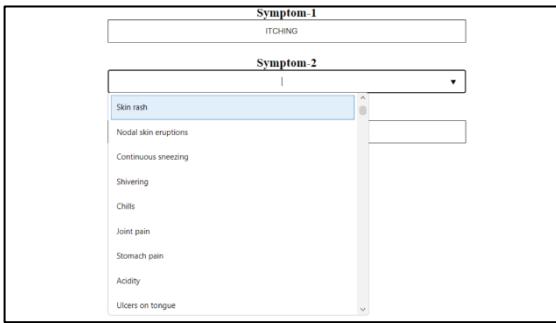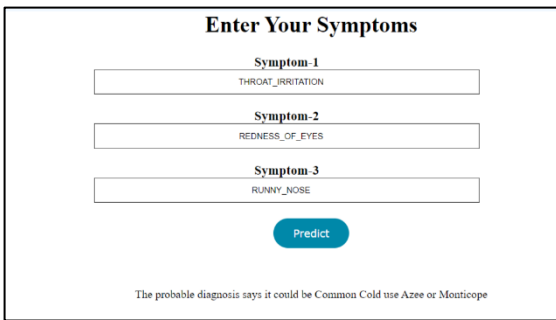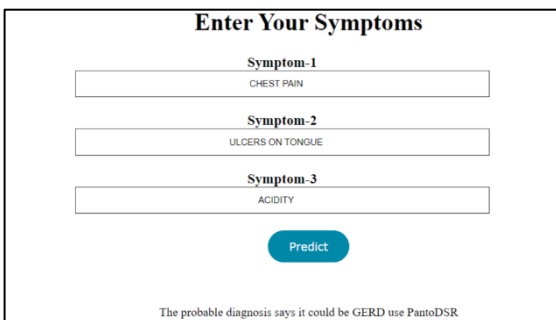
Image 1

Image 2

Image 3

IV. Conclusion

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 classification 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 an average we achieved accuracy of ~98%. System has an easy-to-use interface so anyone can use it very easily. It will decrease the workload 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.

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