

AI Health Care Chatbot

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ABSTRACT

Healthcare bot is a technology that makes interaction between man and machine possible by using Artificial Intelligence with the support of dialog flow. Now a day people tend to seek knowledge or information from internet that concern with health through online healthcare services.

To lead a good life healthcare is very much important. But it is very difficult to obtain the consultation with the doctor in case of any health issues.

The basic aim of this system is to bridge the vocabulary gap between the doctors by giving self-diagnosis from the comfort of one's place. The proposed idea is to create a medical chatbot using Artificial Intelligence that can diagnose the disease and provide basic details about the disease before consulting a doctor. To reduce the healthcare costs and improve accessibility to medical knowledge the medical bot is built. Certain bots act as a medical reference books, which helps the patient know more about their disease and helps to improve their health. The user can achieve the real benefit of a bot only when it can diagnose all kind of disease and provide necessary information. Hence, people will have an idea about their health and have the right protection.

KEYWORDS: Artificial Intelligence, Machine Learning, Webapp

INTRODUCTION

The proposed idea is to create a medical chatbot using Artificial Intelligence that can diagnose the disease and provide basic details about the disease before consulting a doctor. To reduce the healthcare costs and improve accessibility to medical knowledge the medical chatbot is built. Certain chatbots acts as a medical reference books, which helps the patient know more about their disease and helps to improve their health. The user can achieve the real benefit of a chatbot only when it can diagnose all kind of disease and provide necessary information. A text-to-text diagnosis bot engages patients in conversation about their medical issues and provides a personalized diagnosis based on their symptoms. Hence, people will have an idea about their health and have the right protection.

In India the government doctor to patient ratio is 1:10189 and WHO recommends the ratio of 1:1000 which means India is in the deficit of 6,00,000 the doctors.

So, many of the people are not able to get required diagnosis

Due to this the rate of private hospitals are also increased which common people cannot afford. In some places the hospitals are far away from the person's home. Some people are not very comfortable with talking with doctor about their issues

The proper time that a doctor should give to a patient is also much less which sometimes leads to criticalities.

Privacy and security are also a problem these days. Healthcare chatbots will never substitute doctors. But they provide plenty of opportunities to

facilitate their job or to improve their performance. Acknowledging the improvements in information and communication technology. When talking about the health care industry, the possibilities for chatbots grow are relatively high. Although the adoption rate is not yet widespread. The number of healthcare chatbots is increasing. As health services become patient-centric, offering personalized and satisfactory experience is of utmost priority for healthcare providers.

It is being proved that in the unusual case of chatbots, we have a technology where we are not forced to choose between cost and efficacy; the chatbots replacing humans for certain functions definitely makes the process more effective while saving money for both in the short and long terms. A win-win situation which can only get better as the bots become more and more "learned" in their tasks.

These AI implementations in healthcare shows us how the chatbots are improving the state of healthcare in India and will be going very far with its use in a greater number of tasks. It will increase reliability and cost effectiveness to the current scenario of health which proves chatbots to be a boon to mankind.

The Goal is to introduce Health Bot, a system designed to improve the eHealth paradigm by using a webapp to simulate human interaction in medical contexts. Based on Machine Learning and Artificial Intelligence techniques, the webapp is able to overcome the limitation of classical human machine interaction, thus removing bias and allowing the patient to a freer and natural communication. A webapp can successfully be designed to work as a helping tool in doctor-patient communication, but it must be emphasized that it should work as a supplement and never replacement.

All healthcare providers are always willing to help their patients and they understand how it is vital to be available if there is urgent need of medical attention. Unfortunately, doctors have limited time and a lot of patients which doesn't allow them to be available anytime. In their turn, webapp are there for those who need medical assistance at all time. Furthermore, virtual

assistants may be responsible for reminding users to take their medicine and monitoring a patient's health status.

Chatbot as Health Bot

As chatbots in healthcare are highly in demand, medical institutions can offer various services from symptom checking and appointment scheduling to dealing with additional questions. People are able to get answers to their additional questions with the help of chatbot. There is no need for them to call the clinic to clarify some misunderstanding.

Nationally, medical attention was missing in the case of nearly one-third of all deaths. It is likely that most of those deaths warranted some kind of medical attention, and that such attention would have been provided if the households in which these deaths took place were as rich as the top 15%.

METHODOLOGY

1. Data Collection

This database of disease-symptom associations generated by an automated method based on information in textual discharge summaries of patients at New York Presbyterian Hospital admitted during 2004. The first column shows the disease, the second the number of discharge summaries containing a positive and current mention of the disease, and the associated symptom. Associations for the 150 most frequent diseases based on these notes were computed and the symptoms are shown ranked based on the strength of association. The method used the MedLEE natural language processing system to obtain UMLS codes for diseases and symptoms from the notes; then statistical methods based on frequencies and co-occurrences were used to obtain the associations. Dataset is taken from website using a method called Data Scrapping.

Data scraping, also known as web scrapping, is the process of importing information from a website into a spreadsheet or local file saved on your computer. It's one of the most efficient ways to get data from the web, and in some cases to channel that data to another website.

Disease	Count of Disease Occurrence	Symptom
UMLS:C0020538_hypertensive disease	3363	UMLS:C0008031_pain chest
		UMLS:C0392680_shortness of breath
		UMLS:C0012833_dizziness
		UMLS:C0004093_asthenia
		UMLS:C0085639_fall
		UMLS:C0039070_syncope
		UMLS:C0042571_vertigo
		UMLS:C0038990_sweat*UMLS:C0700590_sweating increased
		UMLS:C0030252_palpitation
		UMLS:C0027497_nausea
		UMLS:C0002962_angina pectoris
		UMLS:C0438716_pressure chest

Figure 1: Example of Dataset

2. Naïve Bayes Classifier Algorithm

Naïve Bayes algorithm is a supervised learning algorithm, which is based on Bayes theorem and used for solving classification problems

Naïve Bayes Classifier is one of the simple and most effective Classification algorithms which helps in building the fast machine learning models that can make quick predictions

It is a probabilistic classifier, which means it predicts on the basis of the probability of an object. Some popular examples of Naïve Bayes Algorithm are spam filtration, Sentimental analysis, and classifying articles

The Naïve Bayes algorithm is comprised of two words Naïve and Bayes, which can be described as

Naïve: It is called Naïve because it assumes that the occurrence of a certain feature is independent of the occurrence of other features. Such as if the fruit is identified on the bases of color, shape, and taste, then red, spherical, and sweet fruit is

recognized as an apple. Hence each feature individually contributes to identify that it is an apple without depending on each other.

Bayes: It is called Bayes because it depends on the principle of Bayes Theorem

There are three types of Naive Bayes Model

Gaussian: The Gaussian model assumes that features follow a normal distribution. This means if predictors take continuous values instead of discrete, then the model assumes that these values are sampled from the Gaussian distribution.

Multinomial: The Multinomial Naïve Bayes classifier is used when the data is multinomial distributed. It is primarily used for document classification problems, it means a particular document belongs to which category such as Sports, Politics, education, etc. The classifier uses the frequency of words for the predictors.

Bernoulli: The Bernoulli classifier works similar to the Multinomial classifier, but the predictor variables are the independent Booleans variables. Such as if a particular word is

$$P(A|B) = \frac{P(B|A) P(A)}{P(B)}$$

using Bayesian probability terminology, the above equation can be written as

$$\text{Posterior} = \frac{\text{prior} \times \text{likelihood}}{\text{evidence}}$$

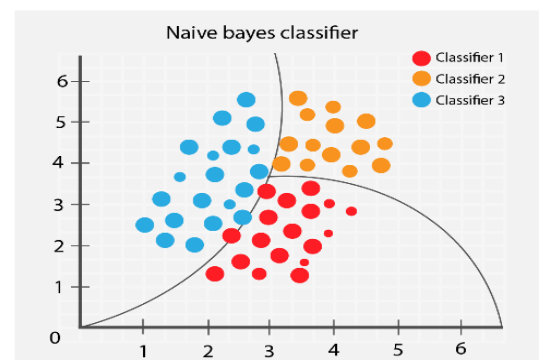


Figure 2: Naïve Bayes Classifier Formula

3. Web-application Deployment

Flask micro-framework would be used to make to web application, for easy integration with Naïve Bayes Model in the backend. Flask Rest API would act as a bridge between frontend and the backend. User will be given some dropdown options to select the symptoms they are facing. Their response will be sent to the backend, analyzed by the Machine Learning model and the result will be sent back.

III. DESIGN AND IMPLEMENTATION

The proposed system will interact with user via web-based platform. After that the application asks for symptoms that the patient is facing. The user inputs the symptoms to which the application responds and provides the disease it predicts the patient can have.

Software will take symptoms into account and then try to predict the disease. System may ask for more symptoms from the user or will suggest some symptoms just to make sure the disease the patient is having is the same disease the system is predicting.

After conformation of symptoms system will classify the disease as major or non-major, if the disease is major then system will try to recommend doctors in that pin area

The webapp can answer to the users based on their disease related queries based on symptoms, causes, and prevention or medicine suggestion.

1. Data Scrapping:

Data scraping, also known as web scrapping, is the process of importing information from a website into a spreadsheet or local file saved on your computer. It's one of the most efficient ways to get data from the web, and in some cases to channel that data to another website. This method has been used to get data from the Website and save and process it in local computer after pre-processing

2. Preprocessing of Data:

Data pre-processing in Machine Learning is a crucial step that helps enhance the quality of data to promote the extraction of meaningful insights from the data. Data pre-processing in Machine Learning refers to the technique of preparing (cleaning and organizing) the raw data to make it suitable for a building and training Machine Learning models.

In this the data pre-processing steps that are done are:

- Data Cleaning
- Feature Scaling
- Data Transformation
- Data Reduction
- Feature Selection Based on p-value

3. Naïve Bayes Using Sklearn:

After checking various algorithms, the Naive Bayes algorithm gives the best results in this dataset. In machine learning, Naïve Bayes classifiers are a family of simple "probabilistic classifiers" based on applying Bayes' theorem with strong (naive) independence assumptions between the features. Training this Naïve Bayes model on dataset took about 5-10 minutes when trained on CPU and accuracy above 92% was achieved.

4. Saving and Deploying the model

This model is deployed as a webapp using Flask, HTML and CSS on Heroku platform.

Heroku is a platform as a service based on a managed container system, with integrated data services and a powerful ecosystem, for deploying and running modern apps

5. Proposed Workflow

Idea is to provide user with all the set of symptoms and predict disease from it, Symptoms will be like: Fever, chills, Pimples, Cough, Sneezing etc. There will be more than 500 symptoms to choose from.

The user will choose the symptoms he/she is facing from the dropdown. The symptoms are passed on to a Naive Bayes trained machine learning model. This model will then predict the disease on the provided symptoms and all the necessary details about the disease.

The webapp asks the user to choose the symptoms from the dropdown provided to which the user responds and the webapp provides all the information regarding the disease it predicted based on the symptoms provided by the user. The system will identify the symptoms by providing the symptoms to the trained machine learning model which is trained on Naive Bayes algorithm which in turn will predict the disease according to symptoms.

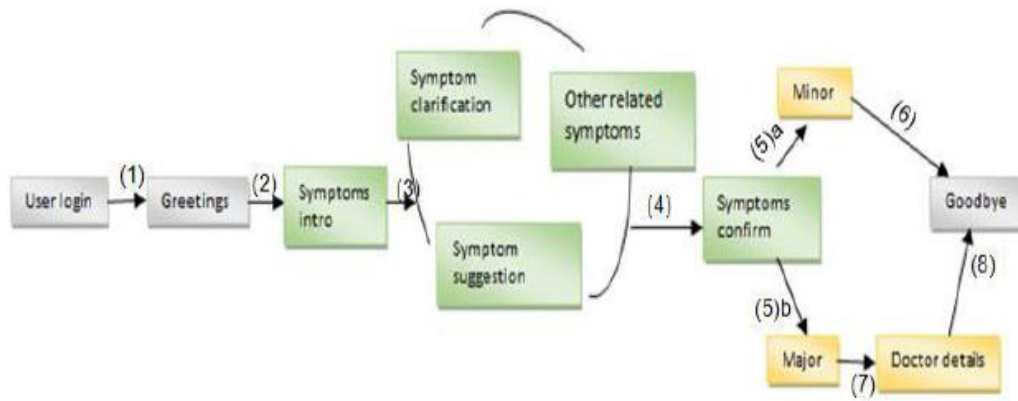


Figure 3: Proposed Workflow

RESULT

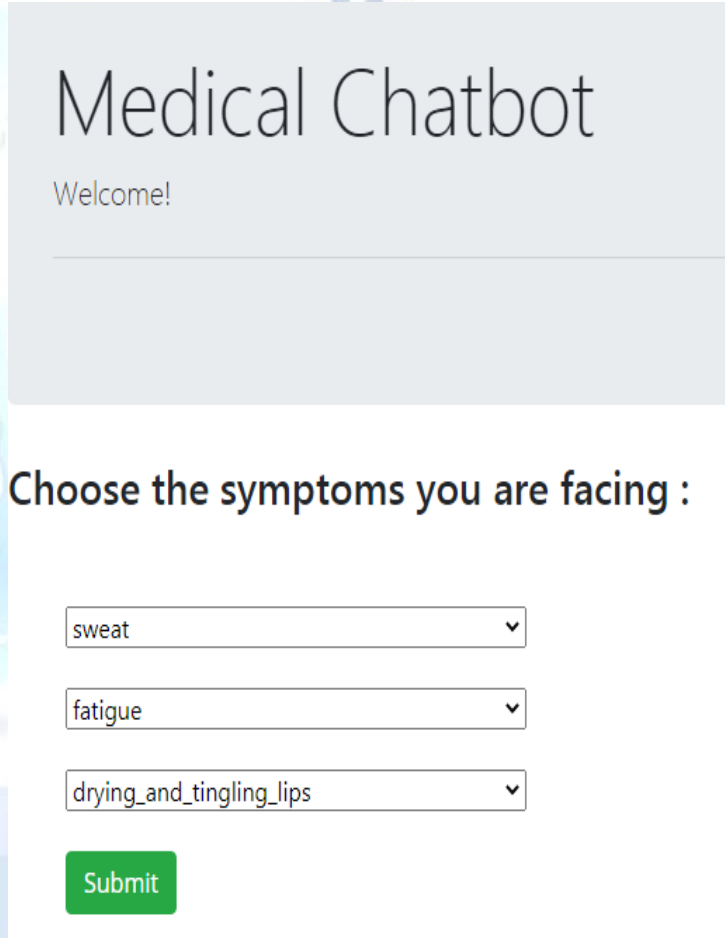
According to the model given above, the final accuracy is stable at more than 92%. The following figure shows the accuracy of my model

```

In [35]: mnb.score(X,y)*100
Out[35]: 92.10526315789474
  
```

Accuracy can be further increased if we increase the number of symptoms to be taken by user, the more symptoms we take the better the model will get. If Symptoms taken are less then Prediction accuracy is also less are there will be many diseases with a single symptom

Hence if we increase the symptoms the better result, we will get. Here accuracy of 92% is achieved when the symptoms taken by user are only three every time



-Web Application Result

The user will choose the symptoms he/she is facing from the dropdown. The symptoms are passed on to a Naive Bayes trained machine learning model. This model will then predict the disease on the provided symptoms and show it on another page.

Medical Chatbot

Disease predicted : Hypoglycemia

Home

Low blood sugar (hypoglycaemia)

Also called: low blood sugar

OVERVIEW SYMPTOMS TREATMENTS SPECIALISTS

Requires a medical diagnosis

Confusion, heart palpitations, shakiness and anxiety are symptoms.

People may experience:

Whole body: excess sweating, excessive hunger, fainting, fatigue, light-headedness, or shakiness

Gastrointestinal: nausea or vomiting

Cognitive: mental confusion or unresponsiveness

Mouth: dryness or tingling lips

Also common: anxiety, blurred vision, headache, irritability, pallor, palpitations, sensation of pins and needles, sleepiness, slurred speech, tremor, or unsteadiness

For informational purposes only. Consult your local medical authority for advice.

Sources: Apollo Hospitals and others. [Learn more](#)

Figure 4: Working Model of webapp and Verification from goggle of result

CONCLUSION

A medical bot provides personalized diagnoses based on symptoms. In the future, the bot's symptom recognition and diagnosis performance could be greatly improved by adding support for more medical features, such as location, duration, and intensity of symptoms, and more detailed symptom description. I am working on adding a new chatting system in the webapp which will make webapp more interactive to use. At last, the implementation of personalized medicine would successfully save many lives and create a medical awareness among the people. As said before, the future era is the era of messaging app because people going to spend more time in messaging app than any other apps. Thus, medical bot has wide and vast future scope.

FUTURE SCOPE AND IMPROVEMENTS

This disease prediction method is fast enough so that it can be used by all the websites for Healthcare process. Also, it provides overall better user experience.

It can be further improved by implementing following:

- Saving user past history of disease and Medication
- Increasing the dataset and refining it more
- Including more symptoms.

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