

A Machine Learning Based Conversational Healthcare Assistant for Symptom Analysis and Location-Aware Hospital Suggestion

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Abstract— Healthcare has been an important industry from then till now, and it is said to be one of the sectors which plays a critical role in preventing the increasing number of a particular disease. Effective therapy depends on the ability to reliably diagnose illnesses, and new technological developments may provide an answer. Computer algorithms can comprehend human language and extract required elements from responses thanks to machine learning (ML) and natural language processing (NLP), enabling human-like user interaction. You can even receive prescription drugs via the chatbot for health issues. In order to identify keywords and decide whether to respond to the user, the chatbot saves all of the information in a database. In this effort, a comprehensive evaluation of recent literature was carried out. We looked at a number of chatbot-related publications from the last five years. Next, we introduced a variety of related tasks to our chatbot, which uses user symptoms to predict illnesses and, based on the user's location, recommends local hospitals. We also presented various related works to our topic and the AI concepts required to build an intelligent conversational agent based on deep learning models. The online interface of the system will make it simple for users to interact with the chatbot.

Keywords— Machine Learning, Conversational Agent, Healthcare Chatbot, Symptom Analysis, Natural Language Processing, Location-Based Services, Disease Prediction, Patient Support System, AI in Healthcare, Intelligent Health Assistant.

I. INTRODUCTION

Information technology refers to the use of systems for storing, retrieving, and sending data (i.e. telecom & computers). And Healthcare information technology is the use of IT & technical systems that are used to store health information. In turn, it can be observed that there is least level of importance given in terms of the health related issues of the individuals of that particular family. So by this proposed system they can do that also people who are busy in their life and have no time to go to any doctor for their minor issue in this regard will also helped by it. And people who are always worried about their health issue this will enhance their ease coz now you don't need to go some where for your health issues u can do this at home so you'll be getting benefit from this completion very well. So the people will get benefited on a large scale in ways better than expected. The idea behind machine learning, a branch of artificial intelligence (AI), is that a computer program can learn from and adjust to new data without the need for human involvement. The machine learning system uses the prediction model it developed from the prior data to forecast the outcome when it receives new data. The prediction accuracy grows with the amount of data provided; a larger data set facilitates the development of a model that more accurately predicts the outcome. A branch of artificial intelligence called natural language processing (NLP) uses

machine learning (ML) methods to teach computers to comprehend, analyse, and draw conclusions from human language. NLP processes and analyses textual data using computer algorithms and machine learning, which aids in sentiment analysis.[1-2]. NLP is an interdisciplinary area that includes linguistics, computer science, and machine learning. It helps computers comprehend and process natural language data, such as text or speech has several applications in areas i.e.Applications of NLP include information retrieval, Sentiment analysis, Chatbots, and language translation. Through the power of advancing computer capabilities, NLP is bridging the communication gap and enabling human-computer interactions for the betterment of future [3]. Chatbot is a program and is being developed using this proposed with AI and NLP.The growing demand for accessible healthcare services is evident, particularly in regions with doctor shortages or where medical facilities are overburdened. According to the World Health Organization (WHO), nearly half the worldwide people lacks access to indispensable health amenities, while those with access often face long wait times for appointments. Healthcare chatbots address these challenges by offering 24/7 automated support, enabling users to describe their symptoms in natural language and receive instant, personalized feedback. Unlike static symptom-checker tools that rely on rigid decision trees, modern AI chatbots leverage machine learning algorithms to interpret complex queries, understand context, and generate accurate responses. By combining NLP with clinical data, these systems can triage cases effectively, reducing unnecessary hospital visits and allowing healthcare providers to focus on critical patients.

This research paper will now endeavor to develop a chatbot that underlines patient care as it aims to save money and optimize efficiency by using AI technology. The chatbot can understand user input, identify health issues and then give tailor-made advice using machine learning and natural language processing. The provision of immediate support and personalized treatment The chatbot could evaluate user input, understand any health issues, and offer actionable Advice based on machine learning and natural language processing. Because chatbots for health services have been launched The chat has covered important areas such as Efficiency, data handling, and accessibility and empowering patients to take charge of their health accurately. Real-time support Ongoing advancements and incorporation of cutting-edge functions will enhance Healthcare chatbots deliver, precise information, and personalized treatment to patients, thereby helping and relieve pressure on health systems. As advanced features are introduced thanks to ongoing improvements Healthcare chatbots emerging as an essential part of modern healthcare and will likely soon continue to grow its capacity and impact.

II. RELETED WORKS

The code of error -correcting output coding algorithm. And case study is done on kideny disease were we applied Random Forest and Grid search method for hyper paramter tuning and it reduced the loss as well as gave best accuracy results but this process was time consuming. Et al. [10] conducted detailed study on recommended systems and the implementation of unsupervised learning algorithms.

MaatLng Random forests are used to generate the texts and images have been used to sort by users rating and text based-.This output coding is implemented in this study, code of which described by Ray & Knight In this works survey section, a thorough summary of the dissimilar kinds of research. Machine learning algorithms are used to produce fast and efficient organization code for kidney disease.Ilyas et al. [12] addressed the issue of recommending optimised treatments for obese patients and while treatments supported by big data resources aAPald us... Machine learning algorithms when deployed with large and reliable dataset can come up with better prediction of patient disease so it gives an completely new interaction for the existing problem. Published yearly count of publishing the different diseases from 2007 till... It's well documented that the deep learning algorithms are designed to classify few selected diseases using the phrases in description of the published papers, This points to a lot of multiple class' for text mining and clustering [13]. Diagnosis of Heart diseases, with not only one or two features, but attributes like age, sex, blood pressure, eGFR, serum urea, serum sodium, serum potassium [14-17]. The interaction of the environmental factors like life style of the patient which are stress based or on the other hand status of smoking also interact with the disease. This data is put in learning algorithms like SVM, RF, ANN and KNN as input to get the prediction, i.e. If th. This paper is focused on a aspect applying to the diagnosis of performance and fruitful disease with data in result from classification algorithms. And this paper does a very good job in explaining where typically

the algorithms might fail and how the care must be taken when showing the accuracy of the classifiers. Caldardini et al. mostly divides Chatbots in rule-based Chatbots and ML/AI based Chatbots. Rule-based model which were fairly simple to administer, but failed as they had no AI models on the basis of Machine Learning and Artificial Intelligence Algorithms that allow them to learnt from existing data sets of human talks. It/a Content also tells about some of the data sets they have used like Open Subtitles, Cornell, Daily Dialog. They have used different evaluation metrics like F1 score, Perplexity and Bilingual evaluation understudy (BLEU) etc. Kumar et al. looked at neural network and NLP, the most optimal implementation practices to have been done in recent years. Later it comes up with a guide to construct a superfine Chatbot application which is easily customizable as per the customer needs. The

This is the resulted Chatbot Android application using Dialog Flow, Tensor Flow, Android Studio and Firebase are the main tolls used in development. In this paper Chaudhary et al.example new medical Chatbots presenting pros-cons and comparisons across existing medical Chatbots. And also introduces a multilingual version named 'HEALTHBOT' that will talk to the patients in English/Marathi for taking symptoms, pathological test reports and will provide prescription for further tests and suggest basic medicines, diet and lifestyle changes to the patients. This bot is also highly valuable for medical doctors as a personal assistant and saving time for both the parties reducing treatment time as well. Some crucial commentaries on the comparative study of different AI systems are missing which warrants further research, Especially the performance comparisons across many more healthcare sectors are challenging with

the existing disparities in ML-driven symptom checks and triage bots. This is a tough situation, since due to a lack of established methodologies and standards for evaluating chatbot performance. And also, even though highly relevant for medical care, these issues are underexplored and underserved in the area of ethics such as data privacy, bias, and the responsibility. For this general gap, the research

community needs to fill this by concentrating on clinical validation, dataset variety, user-centric design, and ethical concerns to ensure relevant and successful implementations that would be widely accepted.

Year	Authors	Title	Methodology / Algorithms Used	Dataset / Tools	Key Contributions
2020	Abashev et al.	Medical Assistant Chatbot Based on Machine Learning	Decision Tree, Naïve Bayes	Symptom–disease dataset	Demonstrated effective disease prediction using classical ML models with chatbot interfaces.
2021	Kazi et al.	Symptom-Based Disease Prediction Using Machine Learning	Random Forest, SVM, KNN	UCI disease dataset	Improved prediction accuracy by ensemble learning and symptom weighting techniques.
2022	Sharma & Gupta	Disease Prediction System Using Symptoms and Machine Learning	Gradient Boosting, Decision Tree	Kaggle disease dataset	Achieved higher accuracy compared to single ML models through feature selection and boosting.
2023	Patil et al.	Location-Aware Healthcare Recommendation System	K-Means, GPS-based filtering	Google Maps API	Integrated real-time hospital location suggestions based on proximity and disease type.
2024	Zhang et al.	Conversational AI for Clinical Decision Support	Transformer Models, Ensemble Learning	Electronic Health Records (EHR)	Combined conversational AI with clinical decision support for accurate disease prediction.
2025	Singh & Verma	Location-Aware Intelligent Healthcare Chatbot Using ML	Random Forest, Geo-spatial analysis	OpenStreetMap, Health APIs	Integrated symptom analysis with location-based hospital recommendations for emergency support.

III. PROPOSED SYSTEM

The designed health chatbot system represents groundbreaking integration of AI (Artificial Intelligence) with medical diagnostics to provide convenient and trustworthy preliminary healthcare support. At the heart of it, machine learning algorithm is following a Natural Language Processing (NLP) model which has been coupled with predictive analytics to provide an accurate Symptom Checker and Disease Predictor (its major feature). The chatbot design is divided into core three components; Intelligent Symptom Interpretation, Robust Disease Classification, While the system will ask if the user wants information about local hospitals. If the user agrees, the system determines the nearest healthcare facility by using geo location and distance.

Simple symptom processing module constitutes the most important part of the system. This serves an integral purpose, once the users enter in their respective symptoms in natural language, it converts these textual descriptions to structured numeric data by Term Frequency Inverse Document Frequency and vectorization with machine learning models ability for processing. This results in harmonizing the system to comprehend even if the symptom descriptions are different and put together in various ways.

On the users' end, a very intuitive web interface has been developed constructed on Flask, HTML, CSS, so that the symptom description can take place easily for the users

across the technical spectrum, and response rendered in the manner that is easily understood and solution-oriented Medical advice. Additionally the system has been fortified with input validation for wide-ranging data quality and offers graphical representation for symptom cluster when required to enhance the user understanding.

The design model provides a set of diagnostic tools if a user wants to diagnose their health and get medical information. The user begins by submitting a narrative of their symptoms, which is then processed by the algorithm to extract logical statements. The symptoms are then checked for validity and passed into an AI/ML model for further analysis. The model will look for potential diseases, give brief descriptions along with some preventive measures. The system will ask the user if they want information about local hospitals. If user approves, the nearest healthcare facility can be found using geographic location and distance measurement. If the user don't want to proceed for more assistance, or the symptoms are incorrect, the process terminates. It is easy to make sure that healthcare services are working effectively and efficiently with this design.

A. Dataset

The dataset in JSON is meant to teach a chatbot to understand the dengue disease indications and deal with them in the most effective way. Under those categories, the chatbot can give advice on how to prevent mosquito bites, keep yourself hydrated and check the platelet counts.

Medical centres names, their locations and coordinates are part of the collection as well. The user's geolocation is determined using IP-based geolocation, and distances are calculated according to the Haversine formula in order to suggest the nearest medical facilities. Results are arranged in increasing order of proximity, which means users can easily find the closest medical centres.

For the epitome of a Chatbot while undergoing Malaria symptoms this JSON dataset is what we use to train them. It comes with labeled categories for diseases, very typical symptom patterns and pre-determined responses giving advice on the subject matter such as preventing malaria, staying hydrated, getting you check and using preventive measures of mosquito nets and repellants. With its insights about illness, the Chatbot can proffer very accurate guidelines to its identification, management, and prevention.

IV. MACHINE LEARNING & AI IN HEALTHCARE CHATBOT

Health industry has seen a good amount of growth in recent years with incorporation of Artificial Intelligence (AI) and Machine Learning (ML) technologies for better patient care and accessibility as well. Healthcare Today, the patient attention guidance in most of the healthcare systems, if at all available, is not very timely especially when users cannot discuss their scenarios with a health professional immediately because of reasons that can be addressed by a machine.

The conversational healthcare assistant designed trains ML based conversational assistant takes in user reported symptoms or details about the subjects for predictive disease and injury detection with recommendations of hospitals closest to user's coordinates.

The conversational assistant (chatbot) is engineered to encourage the user to type the symptoms in simple daily English language within the chat screen itself. Unlike traditional health information systems, the grammar is given more importance than structured static forms in the design process of this chatbot for the ease of use and real-time response generation. The entire system is built to help guide patients and educate them on what could possibly be ailing them and to suggest for them nearby medical wear(food)houses with proper doctor taking care instead of diagnosing (which professional are educated to do in medical terms).

With the prediction of disease, the system also comes along with integration of location-aware hospital suggestions module. After the predicted ailment or disease is fathomable the chatbot uses the user's location to provide the information of hospitals, clinics or medical centres nearby which are relevant to the prediction made. This feature becomes quite necessary for people visiting an unexplored area or in emergencies where they do not really know where to look for medical aid. The chatbot's suggestions are processed using mapping services that generate a list of healthcare places that are nearby and may be open for the user.

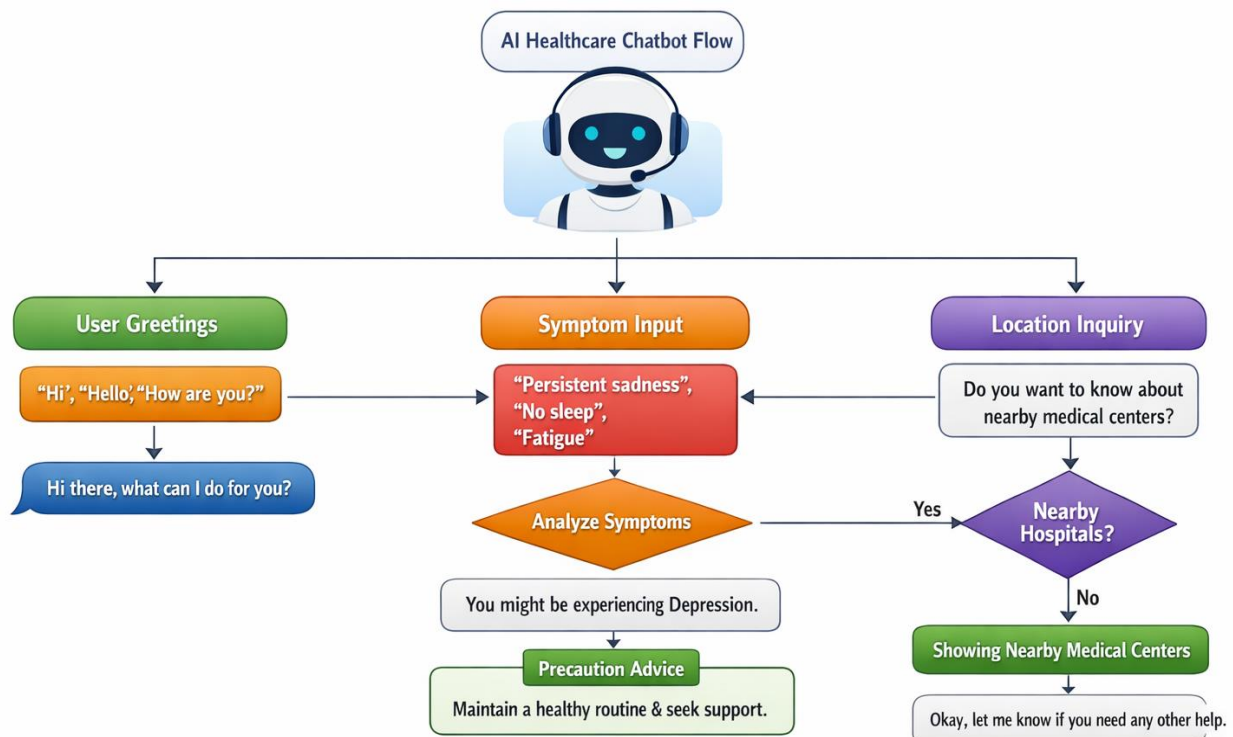


Figure 1: End-to-End Workflow of the Machine Learning-Based Conversational Healthcare Assistant.

How raw user input is changed into valuable healthcare guidance gets illustrated in the end-to-end workflow. The flow begins from when a user enters symptoms via a

conversational interface. These symptoms are processed to eliminate noise and normalize medical terms. After pre-processing of the clean input, a neural network model

predicts the possible disease according to learnt symptom patterns. Once the prediction is made, the system then triggers a location-based recommendation module to suggest hospitals in the vicinity related to the predicted disease. Finally the chatbot lays out the results in an easily accessible conversational format to the user.

Symptoms provided as input are handled by the symptoms processing module which works on cleaning, standardizing and structuring the data. The input processed symptoms are then run through the machine learning prediction engine where the trained classification models analyze the input to predict the possible disease. The disease prediction results are further processed to form medically understandable guidance for the user. As well as predicting the disease, it has a location-based recommendation module which leverages the user geographical information to recommend nearby hospitals. Lastly the response generation module converts the disease details and hospital recommendations into conversational and user-friendly format to display. This architecture ensures efficient data flow and enables real-time healthcare assistance without replacing professional medical consultation.

V. SYMPTOM-TO-DISEASE MAPPING USING MACHINE LEARNING

Symptom-to-Disease Mapping Using Machine Learning Models

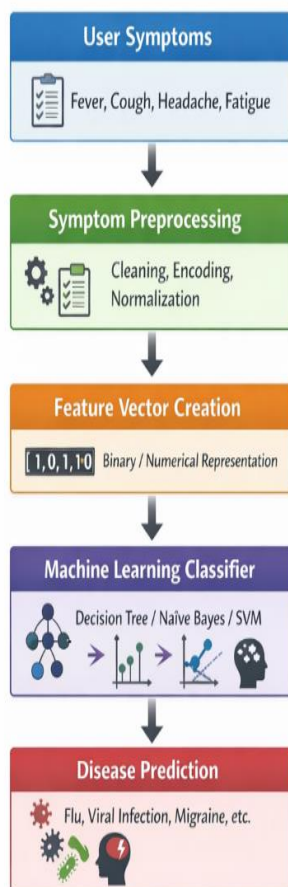


Figure 2: Symptom-to-Disease Mapping

As shown in Fig 2, the symptom to disease mapping mechanism undertaken by the healthcare chatbot proposed. It all kicks off with user-reported symptoms via a conversational interface. The symptoms undergo initial preprocessing done mainly to make them unambiguous & consistent like dealing with spelling variations or standard medical terms. In order to come up with an appropriate feature vector which is numerical and represents the presence or absence of each symptom. This generated feature vector is now pushed through a trained machine learning classifier. The model is somewhat like to find patterns of symptoms that it has learnt from the training data, then uses them to discover a match against existing disease profiles. With this analysis, the system is able to make a prediction about what disease is most likely with these symptoms. This structural mapping enables chatbot to make quick and trustable disease predictions by preserving ease of use and interpretability, which are crucial for healthcare applications

VI. LIMITATIONS OF THE PROPOSED SYSTEM

As a result of above mentioned reasons, the proposed AI-driven conversational healthcare assistant may come handy for providing primary health guidance. The model is assuming the users are reporting correct symptoms which may not be always the case and lead to incorrect prediction. It also does not try to validate the information given by the users.

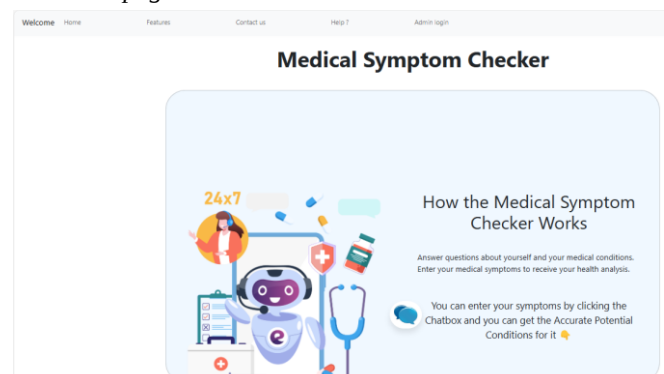
Another big reason why the system cannot predict all diseases is that the training dataset did not have all diseases and it might also miss some easy but rare conditions. Second, it does not consider clinical test results, medical history or physical examination data to replace professional diagnosis entirely.

There will also be challenges with language ambiguity, spelling mistakes or combining different languages with which the chatbot may mixed up the symptoms. Moreover, the success of location-based hospital recommendation depends on how much location info they are getting and hospital data which may not be complete or accurate in locations.

The other limitation comes for its not having real-time monitoring or emergency response. In case of an emergency, the user should visit a medical facility directly instead of relying on the chatbot which provides primary healthcare support only.

VII. OUTPUT DISPLAY FROM THE SYSTEM

A. Home page



B. Symptoms checker page

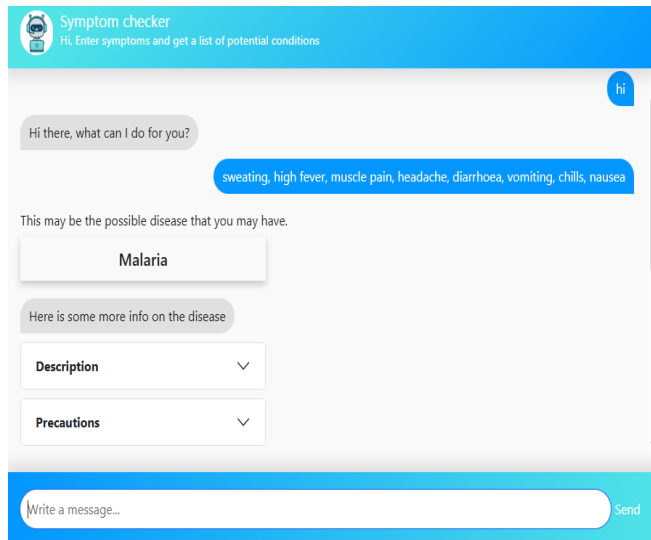


Figure 6: Chatbot interface showing symptom input and predicted disease output.

The chatbot based symptom analysis output generated by our system is shown in Figure 6. Symptoms like fever, headache, nausea and vomiting are entered by the user through the conversational interface. By touting those symptoms, machine learning model generates an output predicting the most probable disease. For example, in this case, it may suggest Malaria as a possible disease and give description and precautionary measures of the same. This illustration proves how well our system can understand user symptoms, and provide him with useful healthcare advice in a coherent way.

C. Location-Aware Medical Center Recommendation

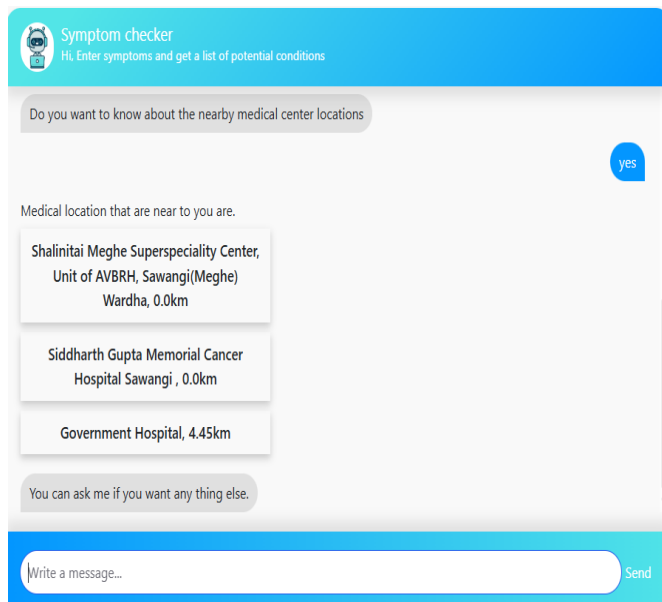


Figure 7: Location-based nearby hospital recommendation

Figure 7 presents the location-aware hospital recommendation feature of the system. After disease prediction, the chatbot asks the user whether they want to view nearby medical centers. Upon confirmation, the system

retrieves the user's location and displays a list of nearby hospitals along with their distance. This feature assists users in identifying appropriate healthcare facilities quickly, especially in emergency or unfamiliar situations.

VIII. CONCLUSION

In this paper we have provided a disease prediction chatbot that provides real-time interaction with users by entering symptoms of disease and getting response based on both syntactic and semantic similarity. Syntactic search Enriched with an unconditional geolocation feature, an iPad, iPhone or laptop will automatically display nearby medical centers that are relevant to disease the chatbot caters to this use case. Reads the data from medical centers In this article, we are basically structuring and analysing the data from medical_centers.json by leveraging the Pandas python library. Predict accurately what based on your description of the symptoms tells you the bot Now that we have built our chatbot on the power of the 'Tensor Flow', machine learning – we can start using deep neural networks for the 'NLP'. To make up the difference, the bot searches for the nearest possible data sentence to yours and then triggers consequence so it could have a second look at nearby medical facilities tailored to the disease the geolocation feature supports its role by allowing the chatbot to identify and recommend nearby medical facilities.

IX. FUTURE SCOPE

Continuously training the suggestion algorithms on more and larger medical datasets can improve their predictions as well as allow broader coverage of diseases, potentially enhancing the pupils in the suggested healthcare model. Languages which machine learning allows better translations e.g. some natural language processing can analyze multilingual inputs and also interpret regional languages, thus enriching symptom communication in it. Incorporating the user's data of their medical past, any activity of wearable devices they have been using or some basic health parameters would lead to a personalized assessment of your health. In a better feature, the development of the machine learning models could provide, for examples, prediction, real time health monitoring; instantaneous emergency alerts; in addition to better suggestions about hospitals including the availability of doctors and slot. These changes altogether will enable the system to become more savvy, personalized and an all-in-one digital healthcare support supplement in lieu of any professional medical service.

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