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# Medical GPT Using Deep Learning

**Shreedhar Maruti Kumbhar**
*Department of Masters of Computer Applications*
*Rajarajeswari College of Engineering*

**Monika R**
*Department of Masters of Computer Applications*
*Rajarajeswari College of Engineering*

**Abstract**

*It is necessary to have good health to live a happy life. However, obtaining a doctor's consultation for any health issue is quite complex. Here the concept is to use the Artificial Intelligence to construct a medical chatbot or a medicalGPT that can detect the illness and provide the basic information about them before consulting a doctor. The increasing demands and complexities in the healthcare industry have sparked the development and implementation of innovative solutions to provide the facility for the patient care. One such solution is the utilization of healthcare chatbots or MedicalGPT, which influence the artificial intelligence and natural language processing techniques to connect with patients and provide them with personalized and effective healthcare services. By enabling automated conversations and providing the realtime responses, chatbots have the potential to streamline the healthcare process, alleviate the burden on healthcare professionals and improve patient satisfaction. Some of the applications of healthcare chatbots across different domains include symptom assessment and triage, medication reminders and adherence support, mental health counseling, health monitoring and feedback, appointment scheduling, and general health education.*

## Introduction

The healthcare industry is undergoing a significant transformation, driven by advancements in technology and the growing need for accessible and efficient healthcare services. Chatbots, powered by artificial intelligence (AI) and natural language processing (NLP) algorithms provide a means for patients to interact with healthcare systems in a conversational manner, enabling personalized and real-time support.

Healthcare chatbots have the potential to address several challenges faced by the healthcare industry. Chatbots can alleviate these challenges by acting as virtual assistants, offering immediate responses and guiding patients through various healthcare processes. By automating routine tasks and providing accurate and timely information, chatbots can improve efficiency and optimize the use of healthcare resources. Another critical aspect of healthcare is patient engagement and empowerment. Chatbots have the ability to enhance patient engagement by providing interactive and personalized interactions. Patients can use chatbots to ask questions about symptoms, medications, treatment options, and general health

inquiries. Moreover, chatbots can offer tailored recommendations, reminders for medication adherence, and personalized health education, empowering individuals to actively participate in their own care.

Furthermore, mental health has become an increasingly significant aspect of healthcare, with many individuals seeking support and guidance for mental well-being. Chatbots can play a crucial role in mental health counseling, offering a non-judgmental and confidential platform for individuals to express their concerns, receive emotional support, and access relevant resources.
This integration of chatbots in mental health care services can expand the access for the patients, particularly for those who may hesitate to seek traditional face-to-face therapy. While healthcare chatbots offer immense potential, several facts need to be considered to ensure their effectiveness and acceptance.

**Literature Survey**

"Healthcare chatbot System using Artificial Intelligence" By N. V. Shinde, A. Akhande, P. Bagad, H. Bhavsar, S. K. Wagh and A. Kamble.This paper presents an exploratory study on using conversational interfaces (CIs) to support physicians in conducting occupational health consultations. It only works as conversational chatbot, rather than diagnosis of symptoms, input by user. It is simple, lot of development needed to make user-friendly.[1]

"Multilingual Healthcare Chatbot Using Machine Learning" by S. Badlani, T. Aditya, M. Dave and S. Chaudhari.The proposed solution describes a multilingual healthcare chatbot application that can perform disease diagnosis based on user symptoms.Language translation is hassle, even single word meaning changes, then result will be different from expected. If inputs are not present knowledge database, then prediction will go wrong.[2]

"Disease Prediction using Machine Learning Algorithms," by C. Sagarnal and S. Grampurohit. The development and exploitation of several prominent Data mining techniques in numerous Real world application has lead to the utilization of the techniques in machine learning environments to extract the useful piece of information about the specific data in the healthcare communities, biomedical fields etc.It only predicts disease based on symptoms. Limited user friendly towards the user.[3]

"Chatbot: A Human to Machine Conversation Model Based On Deep Neural Network " by G. K. Vamsi, A. Rasool and G. Hajela. A conversational agent (chatbot) is computer software capable of communicating with humans using natural language processing. If input data contain an unnecessary words, then machine won't understand. [4]
"Chatbot for Healthcare System Using Artificial Intelligence." by V. K. Shukla, L. Athota, A. Rana and N. Pandey. The idea is to create a medical chatbot using Artificial Intelligence that can predict the illness and provide the required medication about the disease before consulting a doctor. If sentence is least equal, it gives a results of least possibility. It won't much provide details more than disease and its analgesics.[5]

**Existing System**

There are several existing system of healthcare chatbots that have been developed to assist the patient in various aspects of healthcare. These Applications works as conversational chatbot, rather than diagnosis of symptoms, input by user. It is simple, lots of development are needed to make it user-friendly and all the data should be arranged in a particular pattern, so that the bot can answer to the user queries. If sentence is least equal, it gives a results of least possibility. It won't provide much details about the disease and its analgesics. Language translation is rigid, even if a single word meaning changes, then result will be different from expected. If inputs are not present

in knowledge database, then prediction will go wrong. It won't provide analgesis to the diseases predicted. If only one symptom is given as input then disease prediction may be uncertain.

**Proposed System**

A user-friendly chat interface is built in the proposed system, allowing users to engage with it. This system has pre-processed the disease dataset by converting the categorical values into a structured numerical dataset that is suitable for training the Machine Learning models.The user has the option of entering symptoms he is experiencing. The chatbot would anticipate disease or give related information regarding the user's queries based on the user's input. The NLP module receives the input and processes it. The system will do disease diagnosis if the inputs are the user symptoms. This is done with the help of a well-trained Machine Learning model. Deep neural network is employed to have a chat between user and bot.

**Implementation**

**Module 1: Disease Prediction**

The first section is loading data, where in the user loads the dataset and the dataset which is taken went through dataset pre-processing techniques. Using Multilabelbinarizer, we encode the data to 0's and 1's. Where if symptom matches with disease then 1 or 0.

The next section is the model loading and implementation here Decision tree classifier is employed and pre-processed data is feed. The model is trained with pre-processed data and this trained model is used to implement the disease prediction.

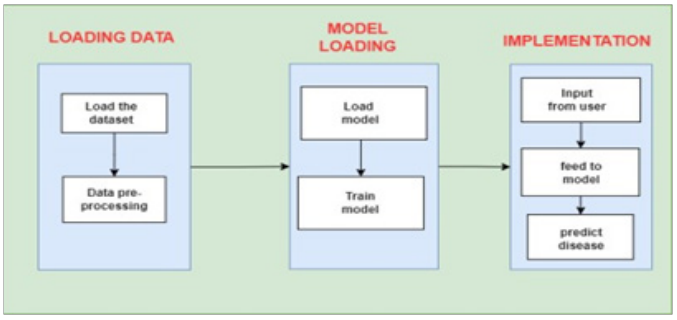


**Figure 1 Disease Prediction Module**

**Module 2: Chat between user and Bot**

In the first section the data is loaded which is given by user. The data is saved in JSON file and preprocessed using NLP algorithms. From Natural language toolkit (NLTK), we import tokenization and stemming for data preprocessing. From data, the patterns are tokenized to tokens and used stemming that is Lancaster stemming. Then each token is sorted in bag. Then we encode the bag of words with 0's and 1's with respective to pattern and tag bag. After this the data is preprocessed.

In next sections, for model loading and implementations we use DNN model, the model is trained with processed data and the model is saved. In implementation, when the input is pre-processed by using NLTK techniques, then pre-processed data is feed into DNN model, then DNN model retrieve the response to user.

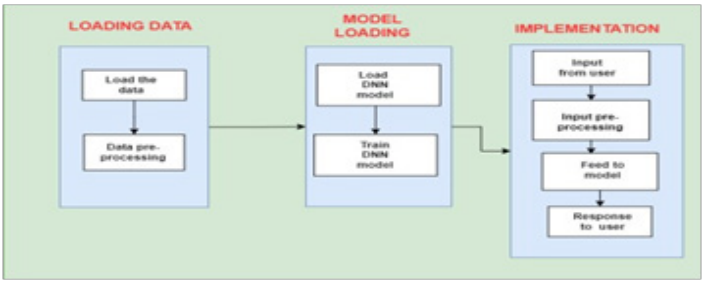


**Figure 2 Chat between User and Bot Module**

**Module 3: Healthcare Chatbot**

The first section is home where the user must register before using the chatbot. If user have already registered then the user can directly login in. In next section, user enters a chatbot interface, where user can chat with the bot. User inputs a query and that input query is processed to see whether to move forward with ML model or DNN model. Input is pre-processed using NLTK, if input is on DNN model, then processed data feed into model, it retrieves the response and display it on chatbot interface. If input is processed and follows ML model, then it predicts the disease and load the medicines, precautions, risk factor and doctor details for that disease and display it on chatbot interface.

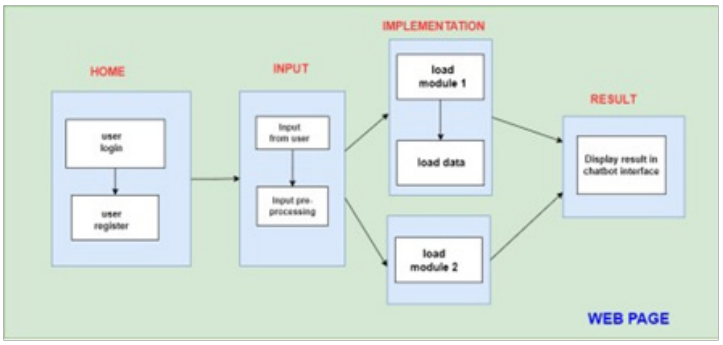


**Figure 3 Health Chatbot Module**

**Experiments and Results**

A disease is an abnormal condition that negatively affects the structure or function of all or part of an organism, and that is not immediately due to any external injury. The Diseases are classified as cause or pathogenesis (mechanism by which the disease is caused), or by symptom(s).

**Data Collection**

- The data is collected from kaggle dataset.
- The data consists of disease and its symptoms.
- The data consists of 41 distinct diseases and contain 132 symptoms.

**Data Pre-Processing**

- The available data is having many null values, so we dropped those null values.
- Using numpy and pandas we set the dataset in ordered format.
- Each column represents distinct symptom, and each row represents the disease in the final collection. Then we split the dataset into training and testing from importing train_test_split library.

- Here the processed tokens is trained in DNN model. Use of bag of words module, using DNN we extract feature of input with respect to patternin JSON file. We take a one with highest feature and from its respective tag, we retrieve response to user.

**Disease Prediction Analysis**

In disease prediction, the input are the symptoms. From the symptoms, the model predicts the disease. For making the predictions we use the Machine learning algorithms such as Decision tree, Random Forest and Naive Bayes. From the pre-processed dataset, we build a model to handle the data for prediction.

**Chat Analysis**

- Chat includes the conversational chat between user and bot.
- When a user enters an input, then bot should respond to that input.
- We have developed a chat data, so it will reply to user, based on pattern match of input given by user.

**Experiment**

- We have used the machine learning algorithms such as Decision tree algorithm to predict the disease based on the input as symptoms.
- The dataset that is Training and Testing data fit to model contains 4920 records and 41 distinct diseases. So the dataset which we train is optimized.
- The dataset is encoded with label encoder, so decision tree classifier helps to predict disease.
- Decision tree: The decision tree algorithm creates the classification model by building a decision tree where each node in the tree specifies a test on an attribute and each branch coming out from that node corresponds to one of the possible values for that attribute.

**Results**

Decision tree model gives accuracy of 0.9512.

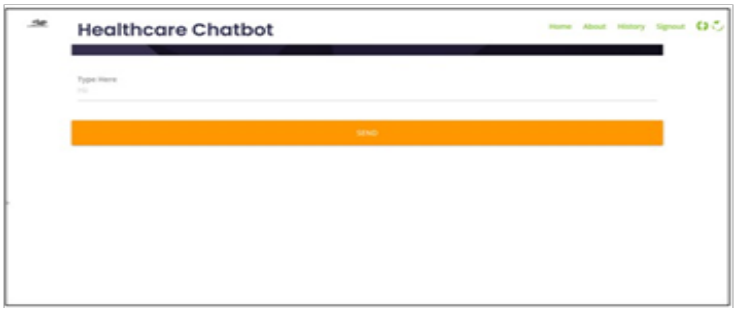


**Figure 4 Dashboard**

Figure 4 shows that In dashboard user can chat with chatbot, along with he can see history, sign out of chatbot and finally home.

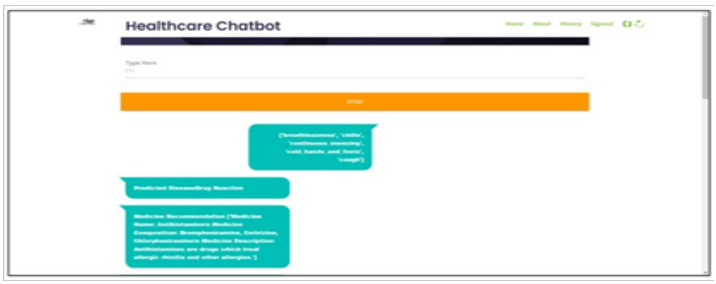


**Figure 5 Result of Chatbot**

**Figure 6 Result of Chatbot**

Figure 5 and 6 shows When input is symptoms, then above shows a bot response to the user.


**Figure 7 History of Chatbot**

Figure 7 shows In this history page, it stores the previous queries of the user.

## Conclusion

The Healthcare chatbots have played an important role for improving the healthcare services and patient engagement. This technology expands and combines the functionality of artificial intelligence and natural language processing to provide personalized and efficient support to patients across the various domains. The applications of healthcare chatbots span symptom assessment, medication management, mental health support, and health education. They enable patients to access healthcare information, receive immediate responses, and actively participate in their own care. The benefits include increased accessibility to healthcare services, improved patient engagement, and optimized resource allocation.

However, the implementation of healthcare chatbots comes with challenges.

The concerns regarding privacy and data security must be addressed to ensure the protection of confidential patient information. Future research and development should focus on enhancing chatbot capabilities, including their conversational abilities and understanding of medical terminology. Evaluating user acceptance and satisfaction among diverse patient populations is crucial to ensure inclusivity and address any potential barriers. In conclusion, the healthcare chatbots are capable of upgrading the healthcare deliveries by providing the accessible, personalized, and efficient support to patients. While challenges exist they continued the advancements in technology, research, and collaboration between healthcare providers and technology experts which can drive the progress in healthcare chatbots, ultimately improving the quality and accessibility of healthcare services.

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