

AI Based Healthcare Chatbot System by Using Natural Language Processing

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Abstract:

Artificial Intelligence has core branches like, Machine Learning which takes in data, searches patterns, improves itself using the data, and displays the outcome. To lead healthy lifestyle healthcare is very much important. In few unsocialized areas, it is quite hard to find a consultation with a doctor that easily regarding health issues. The main idea here is to make a healthcare chatbot based on Artificial Intelligence using NLP that can diagnose the disease and provide required details about the specific disease before consulting or visiting a doctor. Reduces the healthcare costs and improves accessibility to this medical chatbot. Specific chatbots act as virtual medical assistance, 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 kinds of diseases and provide the necessary information. A text-to-text medical chatbot involves patients in online conversation considering their health problems which provides a set of personalized diagnoses based on their provided symptoms. These bots connect with the potential patients visiting the site, helping them discover specialists, booking appointments, and getting them access to correct treatment. This chatbot uses Natural language processing techniques to process and analyze the data and give the output in appropriate manner. It brings up the disease-related problems about whether the task mentioned above should be assigned to human staff. This healthcare chatbot system will provide patients healthcare support online at all times. It helps to generate health data and automatically delivers the information of reports to medical management. By asking the questions in series it helps the patient by guiding what exactly the user is looking for queries.

Keywords —Artificial Intelligence, Machine Learning, NLP, text-to-text, chatbot, healthcare.

I. INTRODUCTION

The Current artificial intelligence has developed to a point where programs can learn by the humans and effectively simplistic human conversations which is essential. One of the best-known examples of chatbots in recent history is Siri the AI assistant that is part of Apple's standard software for its products. Siri took chatbot mainstream in 2011. Since then, brands in every sector have started to

use them, eventually developing a new trend conversational in user experience. This refers to an end-user experience in which your interaction with a firm or service is automated based on user prior behaviour. If users are developing artificial intelligence applications like Alexa, which enables the use of voice to control devices. If you are a user, you can already interact with this Artificial Intelligence chatbot on popular messaging platforms like Facebook, Instagram and so on.

Nowadays the use of chatbots has spread from user customer service to life and death risks. Chatbots are coming into the healthcare industry and can help to solve health problems. Health and fitness chatbots have begun to gain popularity in the market. Previous year Facebook has started allowing healthcare industries to create Messenger chatbots which would then communicate with users. A great example is Health Tap the first company to release a health bot on the Messenger app. It allows users to ask their medical-related queries and receive answers.

II. RELATED WORKS

A. Healthcare Chatbot System

Earlier, the artificial intelligence domain was not developed. After the invention of chatbot systems, the problems of users are solved in less time. In the field of healthcare, automated chatbot deployment in web applications is booming all over the world. Patients suffers from different types of diseases and visit to hospital for treatment purpose. Sometimes doctors are not available due to that, time required for nursing takes a lot [1]. To overcome this issue, medical chatbots were developed. These chatbots are trained and tested on live dataset also accuracy of the output is relevant. The AI based chatbot are fast, reliable and precise. User provide the proper details and receive feedback according to their query. If any user makes minor mistake, the chatbot provides validation and autocorrection features. Nowadays, in every clinics and hospitals portal chatbots are performing multitasking work. A lot of time of patient is saved and tasks are completed in minimum effort.

B. Natural Language Processing

Natural Language Processing (NLP) is a domain of artificial intelligence that provides machines to learn, read and understand the meaning of human languages. Different fields such as Banking, Education, Finance and so on are using chat applications for solving their problems and marketing their products. Majority of the countries

like Germany, Spain, China, India, Korea and so on have their own native language. While interacting with other user, language barrier is created. To reduce this type of complication NLP based autonomous provides variety of languages, which makes communication through verbal and non-verbal easier [2]. In the healthcare chatbot, NLP is used for text processing. The characteristics of NLP in medical domain is useful:

1. Sentence Tokenization: In this method whole sentence is divided into substrings and breaks into smaller words. When a patient enters the query in form of sentences, a whole set of words are converted into tokens, also split the sentences when there is punctuation mark.

2. Word Tokenization: There are varieties of words, which are present in the dictionaries. The segmentation of sentences is carried out. Words are assigned to tokens. The chatbot helps to classify the words according to the category present in medical records and gives the optimum feedback to a user.

3. Stemming and Lemmatization: Stemming is process, where words are chopped out from beginning and end. Whereas, lemmatization is used in morphological analysis for extraction of words. When doctors entered the wrong data on their database, the responses of chatbot are not relevant. These above techniques are used to correct the information and give proper response to a patient in form of text.

III. LITERATURE REVIEW

The literature review plays an important role in understanding the artificial intelligence domain and implementation of the working system. We have included three literature survey papers with proper explanations.

In this paper, Megha Manilal, Shobana AJ, Belfin RV have explained the usage of healthcare chatbot for cancer patients [3]. This paper explains that the cancer can be detected at an early stage. Detection of cancer at an early stage helps to cure the disease and save the patient's life. Most of the people detect the cancer at the last stage. Cancer is a disease

which causes due to lasting growth, and spread of abnormal cells. Cancer patients lose hope to live longer and healthier lives. Depression is expeditiously becoming one of the difficult phases in the health sector. In this paper, communication helps a lot to improve one's mental health, this problem gets solved partially if the patient tries to open up to someone, but nobody is available at right time. This is the reason where chatbot comes into limelight [3]. NLP is used in making of this chatbot which is an important component of artificial intelligence, so we can imbibe same thing in our chatbot for generation of accurate and responsive answers with respect to given queries. This project creates the lucidity in the public data distribution system as the workload becomes faster. The profit to an integrated GPU unit is that it is cheaper which in turn means a less costly computer device. Integrated graphic cards such as Intel, Ryzen also produce less heat and use drastically less power. However, there is no proper security system such as biometric system.

In this paper, Kalpana Devi S, Indumati V, Ishwariya S and Priya Shankar M had taken a survey on Medical Self Diagnosis [4]. This Paper helps to understand the current health related issues and helps by providing necessary suggestion. Here this Chabot is implemented on mobile based applications to handle the user queries. Artificial intelligence is the key methodology used to build those intelligence bots. It is a field of computer engineering that highlights the development of smart machines that work and reacts like humans. Patients having more weight have a serious risk of developing dangerous diseases and health conditions. A rising trend of obesity is not only limited to developed countries, but to developing nations as well. As smartphones have rapidly gained For the sake of weight loss, mobile applications (apps) are used in public health as an intervention to keep track of diets, behaviour, and weight, which is considered more effective than relying on consumer self-report measures. To facilitate objective data, a solution called "Smart Wireless Interactive Healthcare System" (Switches)

is being developed. This Chabot system would provide a temporary detection but patient will have to confirm it with the hospital [4]. The dataset was used for cancer was not able to use for the learning model.

In this paper, Divya Madhu, Shinoy Shaji, Neeraj Jain had implemented medical assistance with the help of natural language processing and mobile development technology [5]. The healthcare chatbot had used and tested on several android devices. Nowadays mobile conversations are becoming the trend in communication. The speciality of such conversations is, they are really simple and time saving mode of communication. So, chatbot can be really successful if it follows all the simplicity of an instant messaging application. Chabot's are usually text driven, with images and unified widgets, which makes it easy to start interacting with a bot. Also, clarity is what helped the most successful brands win confidence users. These things are the core of a Chatbot concept that's the uses gained the success are doomed for success. Basically, there are two types of Chabot's are available unintelligent ones that act using predefined conversation flows written by people and intelligent AI Chabot's that use machine learning. User can read about these two in more detail information in some of our other blog posts. User can fill it with your personality, user brand's identity, make it speak to your users like you would, change its message depending on the input from the user [5]. Nowadays medicine description portal are really stirring and unconventional in interaction and detailing of medicine.

IV. PROPOSED SYSTEM

The proposed method for developing the system consist of web application. Firstly, chatbot is created which can help the users to get the symptoms of their diseases. Then we will add the chatbot link over the respective hospital website which will help the other people to gain the information of medical reports [6]. Database of the system helps to store the records of the users.

A. Architecture Diagram

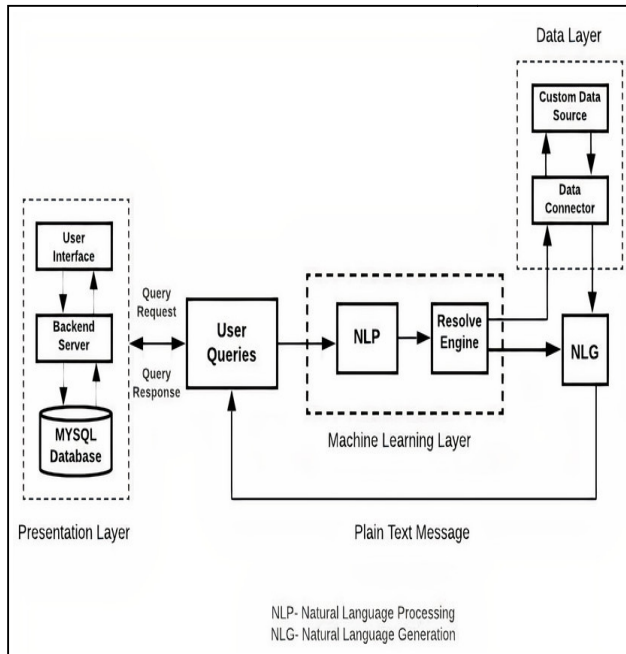


Figure 1: Proposed System Architecture of AI Based Healthcare Chatbot System by Using NLP

We had train a chatbot using chatterbotlibrary and also train the bot to identify certain typesof keywords in order to recognize the user's intent.This information shall then be forwarded to thebackend. The chatbot can be trained to perform somellogical reasoning and responses without referring tothe backend.The proposed method for developing the system consist of healthcare web application. It elaborates the business aspects of the proposed system. Firstly, chatbot is created which can help the users to get the symptoms of their diseases.Then hospital website is integrated which will help the other people to gain the information of hospital and their staff. Database of the system helps to store the records of the users [6] . The backend is responsible to use the processed input from the chatbot and convert it into action to be performed in the database.The proposed system is accessed by two entity namely, Admin and User. Admin needs to log in with their login credentials

first in order to access the healthcare web application. The user queries in form of text are segregated by natural language processing. The resolve engine helps to make decision from the input data and passed to custom data source. The output data is fetched and transferred to NLG engine for checking syntax and grammar of the text. Final message is returned to localhost server and displayed in the interface of the healthcare chatbot. The conversation records are stored in the database which is accessed by admin and manipulated by adding or removing data.

B. Sequence Diagram

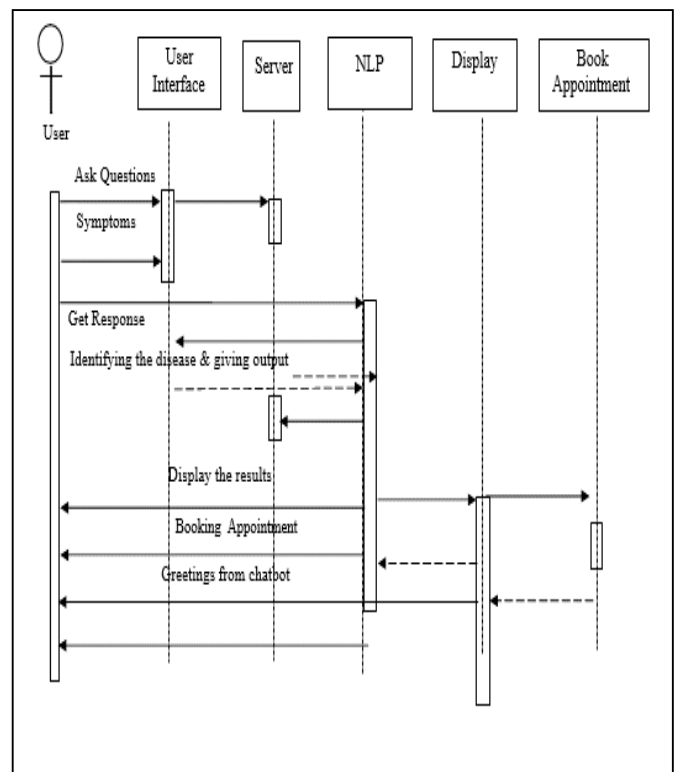


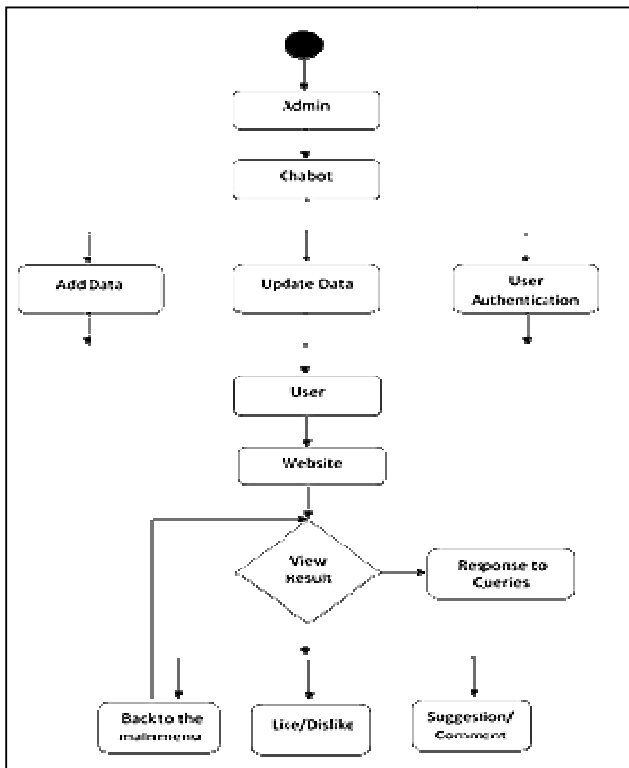
Figure 2: Sequence Diagram of AIBased Healthcare Chatbot System by Using NLP

A sequence diagram simply illustrates interaction between objects in a sequential order i.e. the order in which these interactions take place. Also, the terms event diagrams or event scenarios to refer to a sequence diagram used in a

proper format. This diagram is widely used by entrepreneurs and software engineers to formulate and understand requirements for new and existing projects. The user will give the personal details such as name, age, date of birth, contact number, etc. Chatbot will ask the symptoms from the user and by using natural processing language process it will respond to the disease and suggest the medicines for specific disease. Afterwards it will ask to book the appointment in the hospital. At last, the health care bot will provide the appointment details and allow user to exit the portal by ending up the conversation.

Activity is the specific operation. The user will give the personal details such as name, age, date of birth, contact number, etc. Chatbot will ask the symptoms from the user and by using natural processing language process it will respond to the disease and suggest the medicines for specific disease. Afterwards it will ask to book the appointment in the hospital. The details will be stored in the hospital database in which every staff member can access the reports [7]. At last, the health care bot will provide the appointment details and allow user to exit the portal by ending up the conversation.

C. Flowchart



D. Technical Overview

The healthcare chatbot is designed by using python in backend and user interface design by HTML, CSS and JavaScript. For conversation between user and system the natural processing library is used named chatterbot [8]. The application runs in localhost server which provides appropriate details according to the user queries. In training phase, the train.py file is executed and the new database is created. All the database files are in yml format which are trained in the initial stage of the application model. The frontend interface of the healthcare assistant is displayed on the localhost server and ready to solve the patient symptoms on basis of a specific disease. At initial, the health assistant will take some personal details of the user which will be stored in the database. The diseases like headache, cough, cold, etc are some diseases where user queries are inserted. For a doctor’s appointment, a different data file is created. The training will help the bot to increase the accuracy of the responses. After running the train.py file, it will load the all data into the MYSQL database and it will create a new user [9]. After creating the new database, it will list all the data files and training will be initiated.. That link consists of the chatbot web application that can be used by any internet browser such as google chrome, and so on [10].

Figure 3: Flowchart of AI Based Healthcare Chatbot System by Using NLP

From this flowchart are used to show the flow of message from one activity to the other activity.

V. RESULTS AND DISCUSSIONS

The training phase will train the python file is executed and the new database is created. All the database files are in yml format which are trained in the initial stage of the application model [11]. The web application runs in localhost server which provides appropriate details according to the user queries. In Home page of portal user can interact with tabs. The frontend interface of healthcare assistant is displayed on localhost server and ready to solve the patient symptoms on basis of specific disease [12].

Then chatbot will ask the question where the user supposed to discuss the problems related to health. If the patient is suffering from fever then the chatbot will give the medications. The use of natural language processing is done by text analysis. The tokens are used in form of k1, k2, k3 up to kn. The function loading is created. By using the post method, the response.php is called. For every question new enter, the input text is appended to the output text [15]. Initially, the replacement of special characters is carried out. Then data is stored in an array. All the articles in grammar are stored as tokens which are also known as tokenization in natural language processing. Then processing query is written where user sentence formation takes place by selecting the words and articles. These all steps are working in the chat response section. As the user enters the sentence the scanning of words will be done and particular matching of the token is carried out [17]. Then the condition of the while loop is applied if the particular token word is found then the specific response is given to the user interface. The final web healthcare chatbot application is hosted on localhost server [18]. In Additional, several user interface test cases were carried out for creating test case reports [19].

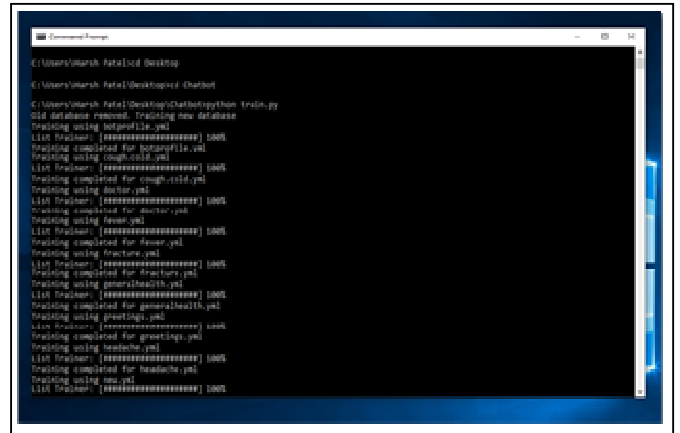


Figure 4: Training phase of AI Based Healthcare Chatbot System by Using NLP

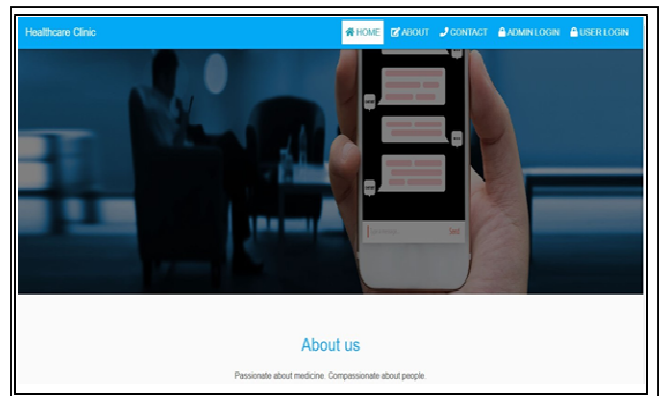


Figure 5: Homepage of AI Based Healthcare Chatbot System by Using NLP

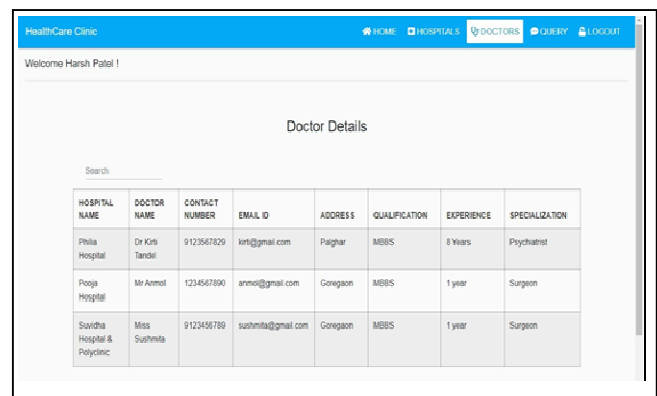


Figure 6: Doctors Details of AI Based Healthcare Chatbot System by Using NLP

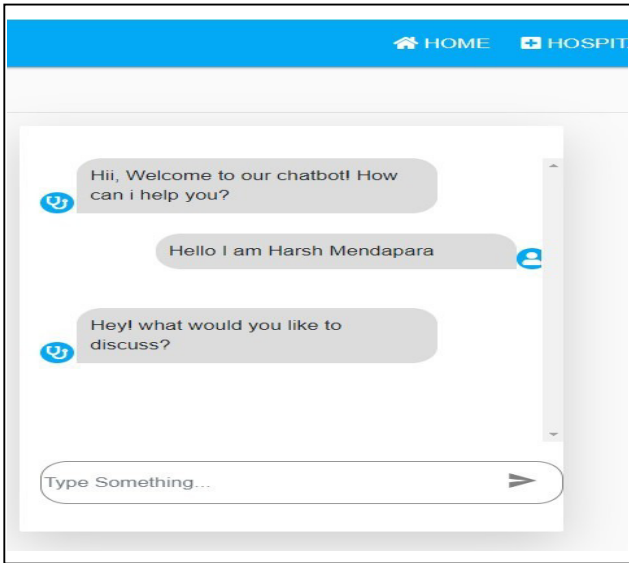


Figure 7: Chatbot Interface of AI BasedHealthcare Chatbot System by Using NLP

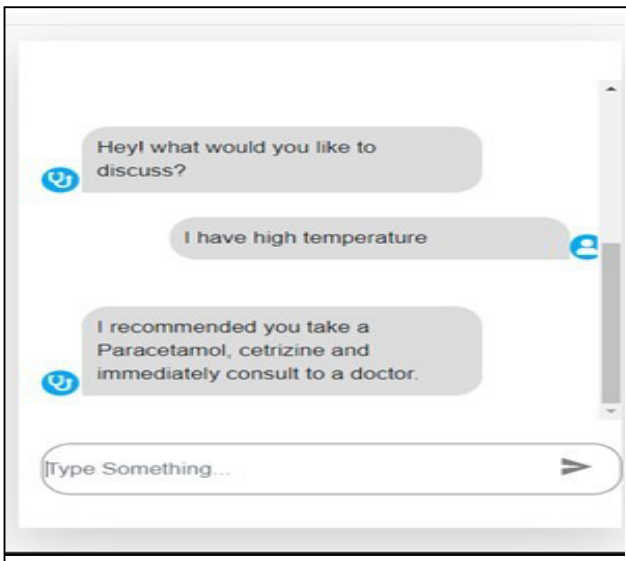


Figure 8: Identifying disease and giving medicine recommendation of AI BasedHealthcare Chatbot System by Using NLP

VI. CONCLUSION

The main aim of the project AI Based Healthcare chatbot system using Natural Language Processing, which is easy to use and more secure than the current system it will cure the diseases and helps to maintain proper health in the current system. This system reduces the possibility of diseases. The information is processed and store in the database, then it is reverted to the user. Also, it provides an accurate information about the heath symptoms and medicines to the patients. The government will also keep the track of the medicines supplied to the medicals and hospitals. By using diagnosis software, the results are generated accurate and fast. For end users it became easy to gain access in healthcare website and explore different types of services. After using such web-based applications, the results of healthcare were affected in different countries and rate of mortality was steadily decreased. With the help of this natural language processing the proposed system can help the government organizations and hospitals also help in the development of the country. Thus, we successfully build up a system for hospitals and medical institute so that user can ask their queries with the medical assistant and book the doctor's appointment by giving text messages.

VII. FUTURE WORK

Future scope of the project could be AI Based Healthcare chatbot system using NLP can also include a mobile assistant in it which will be more functions will be added and can be accessed by many users. Which will also reduce the time and will also be accurate in the health details of patients given to the doctors. We can add biometric system for more secure authentication process.

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