

Self-Diagnosing Health Care Chatbot using Machine Learning

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Abstract

To lead a good and healthy life healthcare is extremely much important. It is very difficult to get the consultation with the doctor in case of any health issues. The proposed idea is to make a medical chatbot using AI which will diagnose the disease and supply basic details about the disease before consulting a doctor. to scale back the healthcare costs and improve accessibility to medical knowledge the medical chatbot is made. Few chatbots acts as reference books, which helps the patient find out about the illness and assists with improving their wellbeing. The user is able to do the important advantage of a chatbot only it can diagnose all quite disease and supply necessary information. A text-to-text diagnosis bot connects patients about their medical issues and gives a customized diagnosis to support their symptoms. Hence, people will have a thought about their health and have the proper protection.

1. Introduction

A prosperous society is when its entire people are healthy. It is important to maintain the health if one wishes to be happy. Only a healthy body can have a healthy mind and it has a positive impact on the performance of people. Nowadays, people are less aware of their health. In their busy life, they forget to take suitable measures to maintain their health and are less aware of their health status. In the latest news by TOI, we can see that people give no importance to their health and find it time consuming to undergo check-ups at hospitals. The busy-scheduled life has got no place for health. Most people comprising the working section of the society claim that their hectic schedule gives them no time for periodic medical check-ups and that they disregard any uneasiness shown by their body until it is too severe.

Medical chatbot has a high impact on the health culture of the state. It has improved reliability and is less prone to human errors. Today's people are more likely addicted to internet but they are not concerned about their personal health. They avoid hospital treatment for small issues which may become a major disease in future. This proposed idea solves this problem. This idea focuses on creating a chatbot which is free of cost and available throughout the day. The facts that the chatbot is free and can be accessed wherever the user is, be it their working environment, prompt the user to have it and use it. It saves the overhead involved in consulting specialized doctors.

2. Related Work:

A conversational agent that interacts with users using natural language is called a chatbot. Many chatbots have been developed using text communication starting from ELIZA that simulates a psychotherapist to PARRY which simulates a paranoid patient [1-2]. ELIZA is well known artificial therapist. The bot attempts to rephrase the questions of the client and responds on certain keywords. If no keyword is found ELIZA replies with fixed phrases to keep the conversation going [2]. Medicine is a field in which help is critically needed.

Robots and other forms of artificial intelligence are used in some sorts of medical applications [4]. Chatbot Erica is developed in Netherlands for a dental practice. This online assistant is used to answer frequently asked questions of patients and visitors on the website [5]. Chatbot goes about as an

individual medicinal services colleague and comprises of a robotized symbol with an installed chatbot and different innovations to give the mentioned data required by the client [6]. Phone Consultation which uses phone that offers time-productivity and cost-sparing advantages as well as the open-finished accessibility and the danger of fuelling request[7]. Online doctor Consultation overcomes geographic obstacles as well as gives the professional understanding for the patient with their concern, with no need to hold back for any medical expert, journey or even losing business days [8]. There are some ways to achieve weight loss success: increasing exercise, reducing food intake, self-monitoring of diet, exercise as well as weight, self-regulation[9]. Dietary change and exercise are the most commonly used weight loss strategies and prior study indicates that weight loss program combining diet and physical activity are more effective[10]. Self-monitoring of diets and exercise are the components of the standard behavioural treatment protocol for weight loss [1]. short message service (SMS) and voice call to help people with cardiovascular disease (CVD) to improve lifestyle and behaviour or make positive lifestyle and behaviour changes [5]. In recent years, due to the rapid evolution of information and communication technologies (ICT), the use of devices as a tool for weight loss management has shifted from mobile text messaging [6], websites [7], to mobile apps [8]. It surveys the present proof for the attainability and adequacy of online one-on-one psychological well-being mediations that utilization content based synchronous talk. Synchronous composed discussions are getting progressively mainstream as Web-based emotional wellness intercessions [9]. The chatbot will go about as a virtual specialist and makes workable for the patient to interface with virtual specialist. Natural language processing and pattern matching algorithm for the development of this chatbot [2]. In this paper, AI can predict the diseases based on the symptoms. If a person's body is analysed, it is possible to predict any possible problem even before they start to cause any damage to the body It has some problems for example, research and usage expenses, and government guidelines are additionally difficulties which are basic to the effective execution of customized medication, yet not tended to by the calculations talked about in [1]. Bot can get the common health related question and prediction of disease without a human interference. This system helps users to submit their queries regarding the health. Customer satisfactions the major concern for developing this system [2]. This system provides a text-to-text conversational agent that asks the user about their health issue. The user can chat as if texting with a human. The bot then asks the user a series of questions about their symptoms to diagnose the disease. It gives suggestions about the different symptoms to clarify the disease. Based on the reply from the user the accurate disease is found and it suggests the doctor who needs to be consulted in case of major disease [3]. The conversational service can provide personalized counselling service to individual head-to-head. It is important to resolve the isolation of the patients who have a mental dis-order such as depression and lethargy One-to-one conversation can resolve the isolation effectively. Personal dialogues can also operate efficiently when a user needs urgent interventions [2].

3. PROPOSED SYSTEM

In the proposed system the user dialogue is a linear design that proceeds from symptom extraction, to symptom mapping, where it identifies the corresponding symptom, then diagnosis the patient whether it's a major or minor disease and if it's a major one an appropriate doctor will be referred to the patient, the doctor details will be extracted from the database, the user will be identified by the login details which is stored in the database.

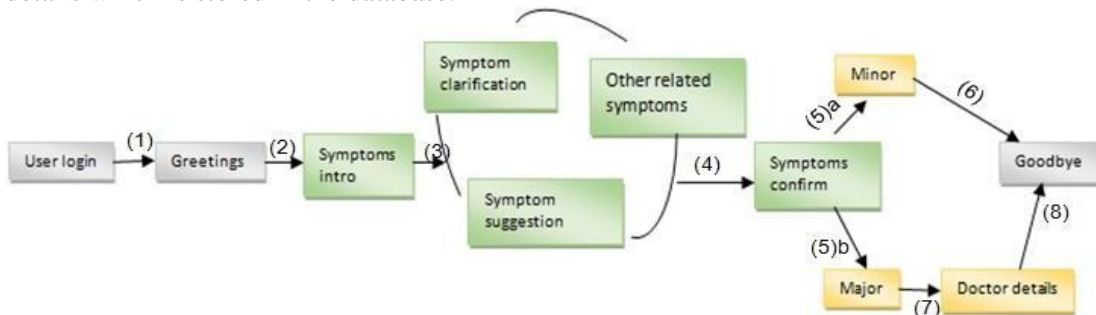


Fig1: Finite state graph

In fig1, Chatbot's dialogue design is represented using finite state graph. In order to achieve an accurate diagnosis, the logic for state transitions are made, natural language generation templates were used, and system initiative to the user and get responses from the user. Our agent has three main conversational phases: collection of basic information, symptoms extraction, and diagnosis. Our bot starts off by asking about the user's email and password for login and then enters a loop of symptom extraction states until it gets sufficient information for a diagnosis. Users have the option of entering the loop again to talk to the doctor about another set of symptoms after receiving their first diagnosis and another option is that the user can view their history of chats about what they have discussed.

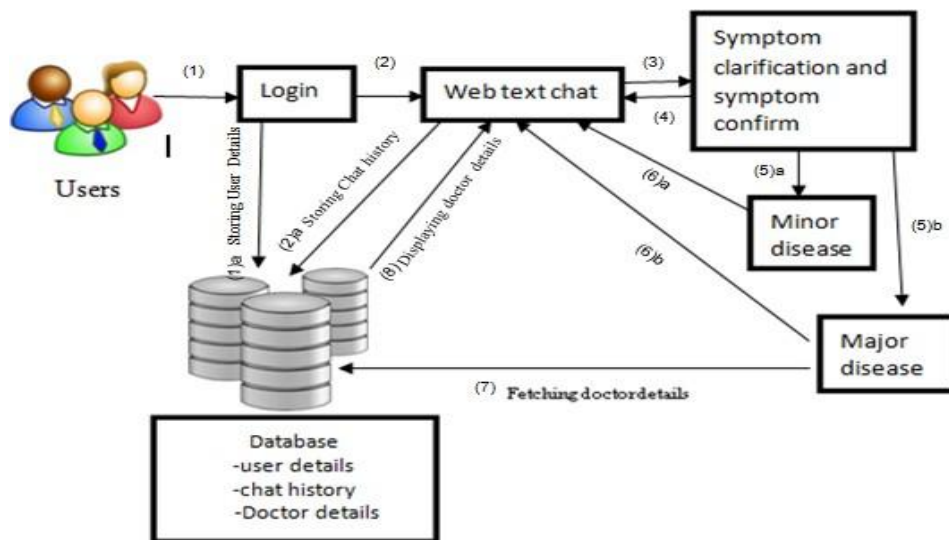


Fig2: Functional Architecture

The above Figure proceeds with the user's login where the users' details will be stored in the database. The user can then start the conversation with the chatbot and it will be stored in the database for future reference. The chatbot will clarify the user queries with series of questions and the conformation will be done. The disease will be categorized as minor and major disease. Chatbot will reply whether it's a major or minor disease. If it's a major one user will be suggested with the doctor details for further treatment.

USER VALIDATION AND EXTRACTION OF SYMPTOMS

The validation of the user login details occurs here. Then Symptoms are extracted using String Searching Algorithm where substring representing the symptoms is identified in the natural language text input. When users give directly the symptom name such as the system will identify it. But however, the system should also be able to handle input like, "When I read, I'm okay at first, but over time, my eyes seem to get tired, and I start to see double." In this case, the system should extract words like "eyes tired" and "see double" (and not substrings like "read" or "okay").

MAPPING EXTRACTED SYMPTOMS WITH TRAINED DATASETS

Given some substring from the user's input, we generate a list of suggested closest symptoms. We then ask the user to confirm if they have any of the symptoms from the suggested ones. Based on their reply few diseases are being shortlisted. Then further symptom clarification and symptom suggestions are being done by asking the users a series of questions and the mapping of the symptoms to the exact disease is done.

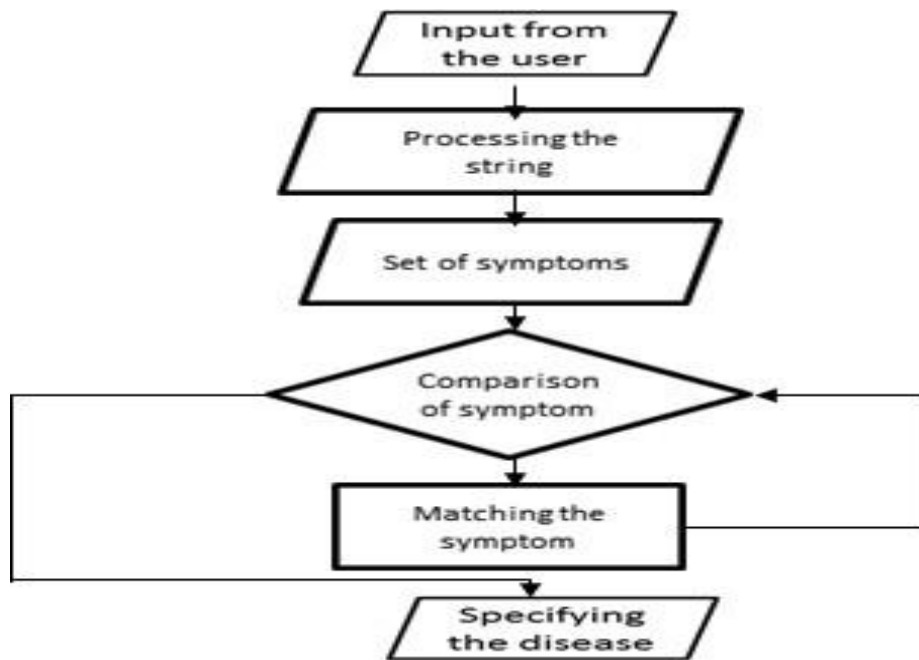


Fig 3: Specifying the disease

SPECIFYING THE DISEASE AND REFERRING A DOCTOR

This process carries the list of diseases in the database and each symptom being entered is compared to the symptoms of the common diseases. The next symptom is checked until a matching symptom is found. They are shortlisted based on the end user's input on the question evaluation. The accurate disease is identified and specified to the end user by the chatbot. The chatbot checks whether the identified disease is a major issue or minor issue based on the conditions built in the chatbot. If it is a major issue, the chatbot refers a specialist to the end user by sending the doctor details. And if it is a minor issue, the chatbot specifies the disease and alerts the end user with first aid or remedy and asks to visit a doctor shortly.

A. Natural Language Processing

Natural language processing (NLP) is a field of artificial intelligence that helps in designing a program to process and analyze natural language data. It permits to set up communications among PCs and people in a characteristic language. The proposed framework is a talk interface that depends on a Retrieval-based model of NLP where the bot is prepared with a lot of inquiries with a set. Such a wise chatbot can manage the patients by comprehension and surveying their side effects that they are features of the Proposed System. Proposed system is a Web Application that has a Chatbot in it.

- i) Build a simple and interactive real-time chat system.
- ii) Dedicated system which is able to solve all the queries regarding a medicine.
- iii) Effective Symptom-based disease prediction.
- iv) Suggest doctors based on the disease.
- v) Book a doctor's appointment for the respective disease.
- vi) Propose specialist's dependent on the manifestations.
- vii) Book a physical check-up.
- viii) Gives updates about the arrangement.
- ix) An installment entryway (sham) will be there to gather the installment and pay it to the doctor.

Decision Tree Algorithm

a) Reference: Machine Learning with Decision Trees by Chris Smith] Decision tree learning is one of the predictive modelling approaches used in data mining and machine learning and also in statistics. It processes the data by observing an item and drawing conclusions about the item. A decision tree has branches, internal nodes and leaf nodes. The First node in a tree is referred as root of the tree.

b) How Supervised Learning Algorithm Works: Given a set of N training examples of the form $\{(b_1, c_1), \dots, (b_n, c_n)\}$ such that x_i is the feature vector of the i -th example and y_i is its label, a learning algorithm seeks a function $a: B \rightarrow C$, where B is the input space and C is the output space. The function is an element of space of possible functions A , usually called the hypothesis space. It is sometimes easy to represent g using a scoring function $f: B \times C \rightarrow \mathbb{R}$ such that g is defined as returning the y value that gives the highest score: $a(x): \arg \max_c f(b, c)$. Let us consider F denotes the space of scoring functions. There are two basic approaches to choosing f or a : structural risk minimization and empirical risk minimization. Empirical risk minimization deduces a function to fit the training data whereas Structural risk minimization deduces a function for the variance of data.

In both of the cases, it is considered that the training set consists of a sample of independent and identically distributed pairs, (b_i, c_i) . In order to measure how well a function fits the training data, a loss function $L: C \times \mathbb{R} \rightarrow \mathbb{R}_{\geq 0}$ is

defined.

The risk $R(a)$ of function g is defined as the loss of 'a'. It represented as:

$$R_{emp}(g) = \frac{1}{N} \sum_i L(y_i, g(x_i)).$$

Software Requirements

- a) HTML, CSS, JavaScript / jQuery: For designing the web application, these are the building-blocks of web pages that allows you to put images, text, videos, forms and other pieces of content together into a webpage
- b) Python (Flask): Flask is an API of Python that allows to build up web-applications.
- c) Sqlite3: SQLite is a C-language library that implements a SQL database engine.
- d) Bootstrap, Push Notification Dynamic Web Changes: Bootstrap is an open source toolkit for developing with HTML, CSS, and JS.

1. Algorithm

a) Chatbot PSEUDOCODE

Step 1: Insert user query in the chatbot window.(INPUT)

Step 2: Pre-processing of the query e.g. suppose there is this query "can I know the dosage of a paracetamol?" (Here the words like: dosage and paracetamol are given much importance.)

Step 3: Fetch only keywords from the query.

Step 4: Chatbot stores the session Information in its log.

Step 5: Processes the Command. Matches the fetched keywords with the keywords in Knowledge base, and provides an appropriate response. A keyword matching algorithm is used to process the query.

Step 6: The response is fetched from the knowledge base and returned as an output to the user.

Step 7: Exit

The proposed Chatbot framework capacities dependent on a Decision Tree calculation. It produces reactions for the client questions dependent on the accompanying technique:

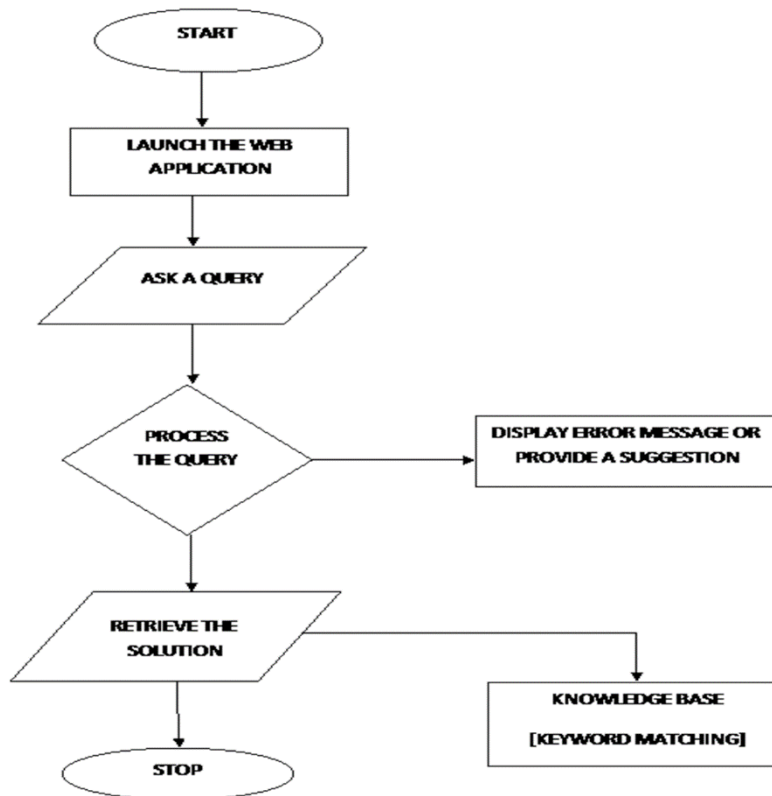


Fig 4: Chatbot Flowchart

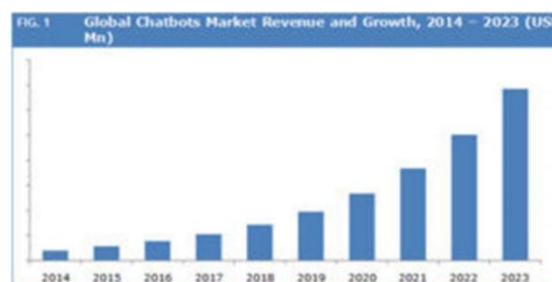
5.RESULTS AND DISCUSSIONS

This area furnishes with the aftereffects of the thorough experimentation of the created system. The proposed framework is a proficient, modest, simple and a speedy method to assist patients with having a coordinated discussion with the Chatbot that encourages and helps them to deal with their wellbeing adequately

A. Improvement of AI and Chatbots in the field of Medicine

Man-made consciousness is a blasting innovation in the present time; numerous human services associations are creating chatbot applications to support patients and clinicians. The stage utilizes preparing calculation to prepare the chatbot framework dependent on clinical conventions that can assist with interpreting persistent symptoms and give a proper finding.

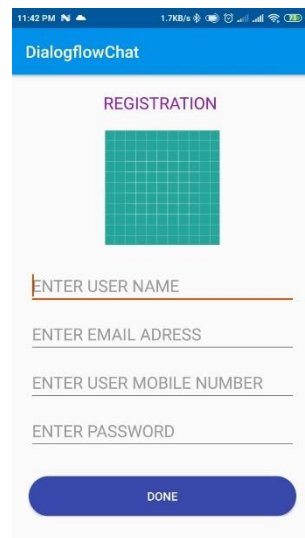
The accompanying diagram shows the ascent of chatbots from 2014 - 2023:



The improvement and utilization of AI based chatbots is relied upon to ascend in the coming a long time as should be obvious in the above chart got from explore made on development of chatbot advertise income for the years 2014 – 2023.

B. The Proposed framework Design

The Proposed Web application permits clients to join and login to their profiles. The application is incorporated with the chatbot interface where the clients can represent their inquiries and get the arrangements from the bot.



Screen capture of the proposed framework is demonstrated as follows:



The clients can book a regular check-up; get an everyday wellbeing tip update as a spring up notice, and Appointment updates on the home screen. The application likewise gives an instalment passage to the patients to make their underlying payment. (optional) Patients or Customers may no longer need to visit the clinic or the clinical organization to get the data he/she is searching for. The framework can be gotten to from anyplace and at whenever advantageously. The chatbot is accessible 24/7. Thus improving the general client experience.

6.CONCLUSION AND FUTURE SCOPE

From the survey of different papers, it is presumed that, the use of Chatbot is easy to understand and can be utilized by any individual who realizes how to type in their own language in portable application or work area rendition. A clinical chatbot gives customized analyse dependent on side effects. Later on, the bot's side effect acknowledgment and determination execution could be significantly improved by including support for increasingly clinical highlights, for example, area, span, and force of indications, and progressively definite side effect depiction. The usage of Personalized Medical collaborator intensely depends on AI calculations just as the preparation information. Finally, the execution of customized medication would effectively spare numerous lives

and make a clinical mindfulness among the individuals. As said previously, the future time is the time of informing application since individuals going to invest more energy in informing application than some other applications. Subsequently clinical chatbot has wide and immense future extension. Regardless of how far individuals are, they can have this clinical discussion. The main prerequisite they need is a straightforward work area or cell phone with web association. The productive of the chatbot can be improved by including more blend of words and expanding the utilization of database so that of the clinical Chabot could deal with all kind of sicknesses. Indeed, even voice discussion can be included the framework to make it all the simpler to utilize.

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