Healthcare Catboat System using Machine Learning

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Abstract— **The application in the field of artificial intelligence (AI) in healthcare is growing. A healthy existence is greatly dependent on access to healthcare. However, obtaining a medical appointment for any health concern is extremely difficult. In this situation, Artificial Intelligence (AI)-driven chatbot can function as automated conversational agents, offering health promotion, education, and even the ability to induce behaviour change. The objective is to employ artificial intelligence in creating a medical chatbot capable of diagnosing issues and offering preliminary information before a patient seeks a doctor's consultation. Utilizing such medical chatbots would reduce healthcare costs and enhance access to medical information. Chatbots, also referred to as computer programs, engage in conversations with users using natural language. To identify keywords in the sentence, make a decision on queries, and respond to inquiries, the chatbot stores the data in its database. To forecast uptake, it is essential to analyse the motive for using health catboats; yet, not much research has been done on how acceptable they are. The purpose of this paper is to understand how patient interact with AI-powered health catboats and how it is useful to patient.**

Keywords— Healthcare chatbot, stop words, Feature extraction, cosine similarity measure

I. INTRODUCTION

Computers supply us with information and aid us in numerous capacities. A chatbot is a program created to emulate intelligent conversation using either text or speech. However, in this paper we specifically focuses on only text-based communication.

These systems have the ability to self-learn and update their knowledge either with human help or by utilizing online resources. This application holds significant importance as it pre-stores knowledge. Employing a chatbot that answers questions and delivers a protocol, this system aims to address user inquiries. Its development aims to decrease healthcare costs and save time for users who may lack immediate access to doctors or experts. Responses to queries are generated based on the user's input and the system's knowledge base. Key terms from the query are identified, and corresponding answers are provided or similar responses are displayed if a match is found.

An expert reviews and resolves complex questions, which are stored in a database. Users can personally inquire about health related topics, saving time compared to consulting a doctor. Input sentences follow a chat pattern and are stored in a relational database management system (RDBMS). The chatbot then matches the user input with its knowledge base. Each query is compared to the chatbot's database, and important keywords are extracted. Sentence similarity is evaluated using methods such as N-gram, TF-IDF and cosine similarity. Finally, different interfaces are created using the JAVA programming language.

II. LITERATURE SURVEY

In this approach [1], words are extracted from the phrases using the n-gram method. Moro phonemes and phonemes serve as the crucial parameter in comparing n-grams and deducing the input with case data. A probability analysis is carried out to determine the closest match. An expert system is utilized to redirect the final statement.

Here, artificial intelligence techniques are used to classify emotions in the research [2]. Utilizing techniques like RNN, deep learning, and convolutional neural networks, the research trains models in emotion classification using a sizable amount of labeled data. Linguistic interaction is crucial in counseling sessions when NLP (Natural Language Processing) and NLG (Natural Language Generation) are utilized to comprehend user talks. In this instance, the multi-modal approach to emotion identification is utilized. In addition to gathering lexical synonym knowledge, they gathered corpuses in order to get word semantic information and express words as vectors utilizing word vectors.

The development of this chatbot [3] was centered around healthcare for an Android application. Users interact with the chatbot by sending voice or text messages via the Google API. The chatbot specifically offers relevant responses to the user. The dataset is categorized using the SVM method, and in this process, superlatives and prefixes are removed utilizing the Porter method.

As the healthcare sector evolves and increasingly prioritizes automated and remote services, medical catboats are becoming more widespread. These digital assistants [4] offer financial savings, timely responses to healthcare questions, and 24-hour access to medical advice. The degree to which these catboats are knowledgeable about healthcare will determine houseful they are. The major objective of this research is to develop a sophisticated chatbot for healthcare using Transformer network architecture. It entails obtaining information, selecting a model, identifying entities and intent, facilitating communication, generating answers, integrating knowledge bases, designing user-friendly interfaces, doing extensive testing, abiding by rules, and always improving. Our goal is to construct a clever conversational agent which can reply

to a variety of healthcare queries and offer customized guidance and recommendations.

To address the limitations of traditional computer-aided diagnosis, researchers [5] have devised software that emulates human thinking expertise. While progress has been made in overcoming many challenges hindering the development of successful artificial intelligence systems, expectations for the emergence of therapeutically beneficial programs have not been realized. Two strategies that have been devised include pathophysiologic reasoning and reducing the number of assumptions a program needs to make. The latter innovation allows a computer to analyze scenarios where the manifestation of one condition impacts the presentation of another. Such reasoning-based prototypes can furnish the user with explanations of their conclusions in medical terms. However, substantial further research and development efforts will be necessary before achieving expert-level computer performance becomes a reality.

In order to facilitate human-system contact and provide basic answers to health-related inquiries prior to visiting a physician, this article[6] introduces an artificial intelligence-powered healthcare chatbot. The true goal of this work is to address the user's symptoms and offer recommendations for treatment in accordance with them to cut down on the amount of time, money needed for the procedure. It's not so much a system as it's a computer application that interacts with users through Natural Language Processing (NLP).

The chatbot[6] processes the user's input, employing sentence keywords to address the user's query and provide a suitable response. Various computations, including Rank calculation and sentence similarity, utilize techniques such as TF-IDF, stemming, n-grams, and cosine similarity.

In order to support hospital healthcare and COVID-19 requests, the study[7] proposes and details the development of a conversational artificial intelligence (AI) agent. "Akira" is the name of the conversational AI agent that was created utilizing natural language processing and deep neural networks. It can read user input, interpret it and determine the user's intention, and then iterate over these processes, sending messages to the user until the user asks to quit or the program ends.

This paper[7] also emphasizes the significance of crafting an interactive human-user interface when engaging with conversational agents.

This study [8] develops a voice recognition chatbot that uses a third-party expert system to process inquiries if the bot is unable to understand them. Web-bots are designed to be text-based online companions that amuse users. Here, they concentrated on how the system might be enhanced if it were trained not just using text but also speech. Here, the input signal analysis and capturing steps are necessary for voice recognition. Data retrieval and information output related to server response recognition. This server employs a black box method based on SOAP. Utilizing an expert system allows for limitless and autonomous advancements in intelligence.

This chatbot's [9] aim is to enhance the interaction between humans and machines. The system keeps its knowledge database so that it can identify the text and determine what

response to the inquire about is appropriate. The provided input sentence gets a similarity score relative to other input sentences using Bigram. An RDBMS, or relational database management system, houses the chatbot's knowledge.
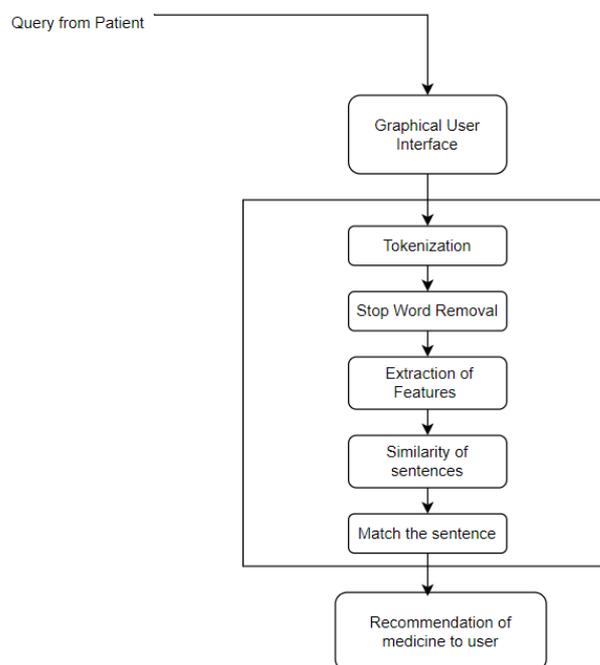
III. SYSTEM ARCHITECTURE

Fig 1: System Architecture of ChatBoat

The user interface gets the query of the client submitted as text. After that, the chatbot software gets the request from the user interface. Tokenization is a pre-processing stage in the chatbot system that involves breaking down textual inputs into tokens. Stop words are removed after tokenization, and approaches like n-gram, TF-IDF, and cosine similarity are utilized for feature extraction. To retrieve answers, questions are submitted and the responses remain in the knowledge database.

IV. METHODOLOGY

The primary goal of the article is to provide users with basic health information. Upon visiting the website for the first time, individuals are required to register before posing questions to the bot. If the response is unavailable in the database, the system seeks assistance from an expert system to address the query. Furthermore, domain experts must register by providing a number of details. SQL is used to maintain the template or pattern that contains the chatbot's data.

For faster processing, the sentences or words were broken apart word by word.

The text is divided into words by an algorithm whenever it comes over a specific character. Punctuation is eliminated, and sentences break up into individual phrases, and this marks the following step.

To extract the crucial keywords from the text, stop words and deleted. It is primarily used to eliminate stuff that is

superfluous, like terms that are used too often in sentences. It is also utilized for removing terms that are redundant or have no special meaning, like an, a, and the. The purpose of this phase is to shorten processing times or lower computational complexity.

Feature extraction is a method used to simplify and condense a document by identifying and focusing on its most important parts. This process improves how efficiently and quickly the document can be processed or analyzed. Specifically, feature extraction helps to pull out key terms and note how often each one appears in the text. This makes it easier to understand and work with the document's main ideas.

The weight of each term in the sentence is determined by taking the product of term frequency and inverse document frequency.

The term frequency is used, with the formula below, to determine the number of times a term has appeared in a given sentence.

$$\mathbf{tf = tf1}$$

The IDF (Inverse Document Frequency) was used to calculate the weight of rare terms across all reports in the document. Words that appear infrequently in the document receive a high IDF score. This is determined by the following condition.

$$\mathbf{idf = log\ (N/df)}$$

The weight of each term or word in the document is determined by combining the TF (Term Frequency) and IDF (Inverse Document Frequency). To calculate the weight of each term in the document, multiply the TF and IDF values.

$$\mathbf{W}i\mathbf{= tfi\ \ log\ (N/d)}$$

The purpose of using n-grams is to extend the n-gram model to include variable length configurations. The sequence may consist of a collection of words, a word class, a grammatical feature, or any other element that the modeler considers to represent a meaningful progression of information about language structure. In this system, N-grams are employed to extract relevant keywords from the database and concatenate the text, thereby reducing the amount of data in the document.

To figure out how similar two sentences are to each other, utilize the cosine similarity measure. The number of query weights directly relates with how comparable the query and content are. As term frequency cannot be negative, the results of the similarity calculation between the two texts range from 0 to 1.The user interface retrieves and displays the query answers that come from the aforementioned process.

VI.   RESULT AND DISCUSSION

With the help of the suggested system, patients can speak one-on-one with a Chatbot that successfully supports and helps them take care of their health at a low cost. Users can report symptoms and receive solutions from the chatbot with its assistance. The system is conveniently accessible at any time and from any location. The conversation Chatbot is accessible around-the-clock. After carefully calculating the correctness, we obtained a percentage of 80.20.

VII.   CONCLUSION

A valuable tool for conversational interaction is a chatbot. In this scenario, the application is tailored to deliver prompt, high-quality responses. By utilizing an expert system to deliver responses directly to users, it reduces the workload for the answer provider. The objective of this initiative is to save users time when they seek medical advice from professionals or physicians. In this context, we have created an application that employs TF-IDF and N-gram techniques to extract keywords from user queries. Each keyword is carefully evaluated to determine the appropriate response to the inquiry. The user interface is designed with the user's input query in mind.

Continuous improvements to the application's efficiency and security ensure user safety, while its functionality includes extracting characters and retrieving answers for user queries accordingly.

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