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Tabib : Chatbot for Healthcare Automation with Audio Assistance using Artificial Intelligence

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Abstract

Individuals must prioritize health care in order to live a happy and healthy life. However, consulting a doctor in the event of a health problem is not always straightforward. The proposed concept is to use Artificial Intelligence to construct a chatbot for healthcare as a virtual assistant. Natural language processing and neural networks will be used to train the medical database in the healthcare chatbot system. The healthcare chatbot was created to lower total healthcare expenses and enhance access to medical knowledge. There are certain chatbots that operate as medical reference books, providing patients with additional knowledge about their ailment and assisting them in improving their health. In the proposed paper the chatbot system converses with patients about their health difficulties via voice-to-voice & text-to-text and offers a customized diagnosis based on their symptoms. In addition to text assistance this chat bot has audio assistance feature that massively help the disabled (visually impaired) patients to access the system. This feature eliminates the restrictions that visually impaired patients face with currently available text enabled healthcare chat bots. We will be using the current location of the user and provide information about all doctors that are in and around the users location. Users can book appointments with different doctors in their locality. As a result, people will be aware of their health status and get immediate medication and will be aware of appropriate therapies.

1. Introduction

Artificial Intelligence is built on how a device sees its environment and takes actions depending on the facts it perceives in order to attain a good outcome. It's the research into intelligent agents. Artificial Intelligence offers a machine the ability to think and act like a person. A chatbot, also known as a talkbot, chatterbot, Bot, Interactive agent, and so on, is a computer programme that conducts a conversation using voice or text techniques, acting as a conversational partner instead of people. Healthcare chatbots are currently being employed for a variety of practical reasons such as customer service and information collecting (Balasubramaniam, Velmurugan, and Saravanan) (Buddesab, Thriveni, and Venugopal) .

Natural language processing is used by most chat-

bots to read user input and provide the appropriate response, however some simpler systems search for a keyword inside the text and then respond based on the matching keywords or a pattern. Chatbots, which are part of virtual assistants like Google Assistant, Siri, and Alexa, are becoming increasingly popular and are being employed by many organizations apps, websites, and instant messaging systems. Chatbots used for amusement, research, and social bots that promote a specific product, candidate, or topic are examples of non-assistant applications. Chatbots are computer programmes that communicate with users through natural language. Though each chatbot is distinct in its own area of knowledge, the flow is the same for all types of chatbots. One input from a human is matched against the chatbot's knowledge base (S. Pranav et al.) (P, Thriveni, and Venugopal) .

2. Related Survey

As per Malamas et. al. (Malamas, Papangelou, and Symeonidis) the usage of a virtual assistant to diagnose sickness and schedule appointments could be critical in the near future. Early detection of sickness puts us one step closer to eradicating serious life problems like death. Overall, the paper assistant aims to create a positive impact in the most effective manner possible. As addressed by Sharvari Patila et. al. (Jinal et al.) users may find a chatbot useful since it can aid them in resolving problems by communicating with the bot and offering suitable diagnoses. With such a rigorous schedule, it is impossible to visit hospitals for check-ups on a regular basis. Chatbots are self-contained programmes that can solve minor problems quickly. Because the chatbot is free to use, it can also help users save money on healthcare visits. Additionally, users will not miss much of their drug regimen, supporting in the pursuit of a healthy lifestyle. Scanning functionality would help consumers obtain a better grasp of the medicines they're taking, allowing them to take preventive measures if additional medication is needed. The capacity to combine a patient's whole medical history in order to aid in further diagnosis is one of the many possibilities in the future of healthcare. Furthermore, a robust system that can acquire real-time health values for patients and monitor for rapid changes in the numbers or any values that are outside of a range might be constructed. An alarm should be given to both the patient and the doctor in the event of any changes, enabling for preventative steps to be taken. A video conference option might be implemented to save users time by eliminating the need for patients to visit clinics and wait (Gandhi et al.) .

The goal of the paper, as per Mohnal Gup de Arriba-Pérez ta et. al. (De Arriba-Pérez et al.) , was to examine the technological aspects and development methodologies of chatbots that are used in the medical field to help patients and medical professionals stay connected without having to be physically present to answer patient questions about illness. Patients can text or voice message the bot with questions, and the bot will react. Depending on the logistics and specific tasks of the technology, physicians recognised both costs and benefits associated with chatbots. Chatbots could be useful in health care for supporting, encouraging, and directing patients, as well as doing administrative work; in other words, chatbots could replace non-medical caregivers. Incapacity, on the other hand, continues to be a cause of contention. Healthcare chatbots, according to Vinod Kumar Shukla et. al. (Lekha et al.) , represent the future of medicine since they lessen the amount of physical contact between patients and doctors in today's ever-increasing population. Natural language processing is used by the chatbot to communicate with the user. Bot uses pattern matching to recognise user input and responds accordingly from the dataset provided. A brief summary of herbal medicines, their uses, and appropriate home remedies for treating and curing the majority of common ailments will be included in the proposed system.

Natural language programming and artificial intelligence were combined to develop a chatbot co-design by Balasubramaniam et al. (Balasubramaniam, Velmurugan, and Saravanan) . The application's goal was to quickly offer the right kind of responses. By immediately expressing the response to the client through a professional framework, it relieves the load from the provider of the proper response. What will be necessary to build an effective conversational interface that uses chatbots to deliver health information is not yet known. A fundamental transformation in how we view customers, correspondence, and data has been brought about by the introduction of chatbots as

conversational user interfaces (UIs). A successful medibot can be created by utilising a deep learning model. Lekha Athota et. al. (Athota et al.) talked about an good conversational tool is a chatbot. The programme was designed with the intention of delivering top-notch responses in a brief period of time. By transmitting the response to the user immediately via an expert system, it lessens the burden on the answer provider. By removing the need to consult doctors or specialists for healthcare solutions, the initiative was developed to save consumers' time. In this instance, we extracted the keyword from the user query using the N-gram and the TF-IDF. Each keyword is weighed down in order to provide the appropriate response to the query. Users can enter questions through the online interface. By preserving user privacy and character, as well as prompt response to queries, the security and effectiveness of the application have been enhanced.

Working with chatbots has given us a taste of the virtual assistantship environment and how it will impact our lives in the future, as Prathamesh Kandpal et. al. (Kandpal et al.) discussed. After analysing the current work and research being done in this field by businesses and other organisations, it is obvious that chatbots will play a significant role in both large and small enterprises as well as other organisations. The several packages that need to be installed, the workflow of the code, the creation of data in the intents file, training our model, and getting relevant output were all explored in this study. The many business applications, related tasks, typical roadblocks, and restrictions of chatbots were also covered. Healthcare is one of the most important areas where technology is advancing. Additionally, the patient will benefit from these treatments by learning more about the problems they are facing. Additionally, it will help hospitals by easing the strain of having to care for a huge number of patients. The creation of a well-trained bot for any service should be any organization's top priority.

Based on the biological facts and scenarios offered, Tae-Ho Hwang et. al. [8] proposed a study that acted as a basic healthcare counsellor, although it had limitations in terms of disease prediction and diagnosis using medical data. For the recommended Interactive Health Care Advisor to be more efficient in healthcare applications, an artificial intelligence system that reflects and judges health issues from biological information as well as lifestyle patterns must be built. In the future, more research into "health condition determination algorithms" based on biological data and individual life patterns, "health condition change prediction algorithms" based on biological data changes and life patterns, and "Healthcare Advisor Process Algorithm" using chatbots will be required. Shreekar Kolanu et. al. (Kolanu et al.) proposed a paper in which users might learn and adopt a healthy lifestyle more quickly. It has also piqued users' interest in going forward and determining whether or not they require a diabetes strategy based on the questions given. It also assists patients in selecting the best diet plan for them, as well as determining whether they are in the early or late stages of their illness. By providing a choice-based flexible appointment system, the purpose is to make it easier to prescribe diets based on diabetic type and to assist them in making an appointment at the best suggested hospital. People who are just starting to acquire diabetes or who expect to develop diabetes in the near future may benefit from this method if they take safeguards ahead of time by following recommended diets and being healthy today and in the future. The purpose of this paper was to develop a Web-based platform with AI-Bot integration that would consider the many factors that affect diabetic customers and help them maintain a healthy lifestyle, which is critical for long-term health.

The authors of this research, Mamta Mittal et. al. (Mittal et al.) , presented a patient-friendly chatbot on hospital administration that aims to provide all of a hospital's important information with just one click. Using a bag of words method, the system analyses human language and detects grammatically incorrect or incomplete sentences using natural language processing techniques.

3. Proposed Work

The user of the current system is not provided with a voice interface function. Designers include the capability of voice input user interaction. Users who are disabled (visually impaired) may find use for this function, which enables them to use the AI Chatbot via audio and hear and respond to questions. The user's current location will be used by the bot to inform users of the specialties of nearby doctors so

they may make appointments using a voice or text interface. The user interface of the current system appears to be difficult; a new window tab is launched for each information. The suggested system aims to simplify the User Interface (UI) by consolidating information into a single window, substituting icons for lengthy sentences, and including many other features. The proposed effort primarily demonstrates that users who are blind or visually challenged can utilise our chatbot. Users can also engage with chatbots using a speech interface in addition to a textual one. The proposed voice-enabled AI healthcare chatbot has been designed using the Rasa interface for designing, training, and testing the chatbot; the Talkify API for Text-to-Speech output; and the Web Speech API for Speech-to-Text input.

4. Implementation Environment

The modules used to design the chatbot are as follows: Natural Language Processing, Rasa, Talkify API (text-to-speech), and Web Speech API (speech-to-text). Python is employed as a programming language, while Flask is used to connect the frontend and backend components. The chatbot's front end was created using HTML, CSS, and JavaScript, and its back end was created, trained, developed, and tested using the Rasa interface. To make computers understand human languages, a programme called Natural Processing Language (NLP) is employed. Users can receive speech output using the Talkify API, and they can submit voice input via the Web Speech API. Below, we go into detail about each module (D. S. Pranav et al.) .

4.1. Rasa

Rasa is a conversational AI that is open source. At scale, Rasa automates conversational customer experience. NLU research at the cutting edge In-house machine learning research that is at the forefront of the industry Understanding messages, classifying intents, and capturing context are all important. Identify the significance of messages. Convert free-form text into structured data in any language. Multiple intents are supported, as well as pre-trained and custom entities. NLU that may be customised for any domain, industry, or use case. Hold in-depth discussions, Use machine learning-based dialogue management to keep vital context and hold back-and-forth talks. Handle subject shifts with ease and incorporate business logic into conversation flows. Learning that is interactive, By conversing with your assistant, you may generate training data and provide feedback when it makes a mistake. Rasa Open Source uses YAML to organise all training data, including NLU data, tales, and rules, in an uniform and flexible approach. The training data can be distributed among any number of YAML files, with each file containing any combination of NLU data, tales, and rules. The top level keys are used by the training data parser to determine the training data type. The domain is stored in the same YAML format as the training data, and it can be split into many files or concatenated into a single file. The definitions for answers and forms are included in this domain.

4.2. Natural Language Processing

The study of computer programmes that understand human language is known as natural language processing (NLP). NLP will be used to interpret the user's input (syntax) in order to automatically analyse and portray human language in a machine-readable format. To train the model, we'll use datasets. It will conduct sentimental analysis on trained datasets and diagnose diseases based on input symptoms, as well as schedule appointments. NLU (Natural Language Understanding) is a technique for extracting structured data from user messages. This usually comprises the user's intent as well as any entities contained in their message. You can supplement your training data with additional information such as regular expressions and lookup tables to aid the model in correctly identifying intents and entities. NLU training data consists of example user utterances that have been categorised by intent. Give your intentions titles that correspond to what the user wants to accomplish with that purpose, keep them in lowercase, and eliminate spaces and special characters to make them easier to use (Schank) .

4.3. Talkify API

A JavaScript library that adds world-class text-to-speech functionality to any website in minutes. Talkify Web Reader is a free online text-to-speech service that lets you listen to your favourite blog, newspaper, or website. Web Reader works with all major browsers and devices, reading websites aloud with natural-sounding voices. It also support the built-in natural-sounding voices in your browser.

Talkify Voice is a solution that quickly turns your app into a speech-enabled app. Talkify Voice makes speech integration simple and elegant with a large voice library and a bespoke JavaScript API for web apps. Additional features, such as language recognition and offline support, are also available through Talkify Voice. Talkify is a virtualization technology that converts text into natural-sounding, lifelike speech. This aids in the development of voice applications and products. Users with visual impairments or those who do not have direct access to a screen can benefit from a speech-enabled device. A web application or a formal announcement system can both be speech-enabled products (Ghosh) .

The front-end portion of the website, which serves as the chatbot's home page, is seen in Figure 1 below. The user can communicate with the bot using both voice and text input. The input is subsequently forwarded to the back-end, where the NLU, which has been trained for certain inputs, recognises the human input and produces the output. Figure 2 illustrates the user's voice input to the chatbot, "Hello," Both voice and text responses are provided to the user by the bot. The user is also prompted to indicate which specific details, such as symptoms or scheduling an appointment with a doctor, they require information on. The user is depicted in Figure 3 expressing a symptom that they are experiencing. The bot asks questions about the type of symptom the user is experiencing and responds to the question accurately in accordance with how it has been trained for particular inputs. In Figure 4, the user responds with a specific type of symptom that they are experiencing, and the bot provides the best advice on what measures the user should take next.

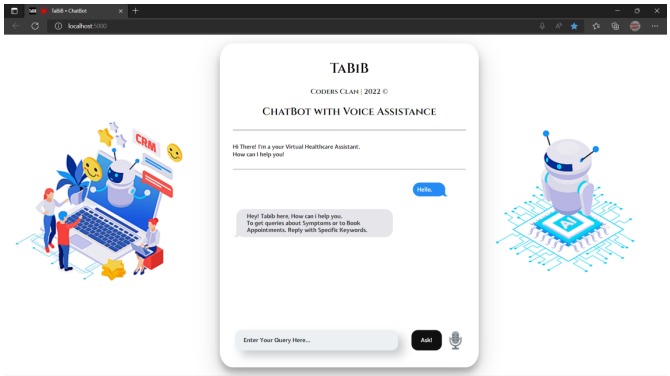

FIGURE 1. Home Page of Tabib Chatbot

FIGURE 2. Bots Response for users Greeting

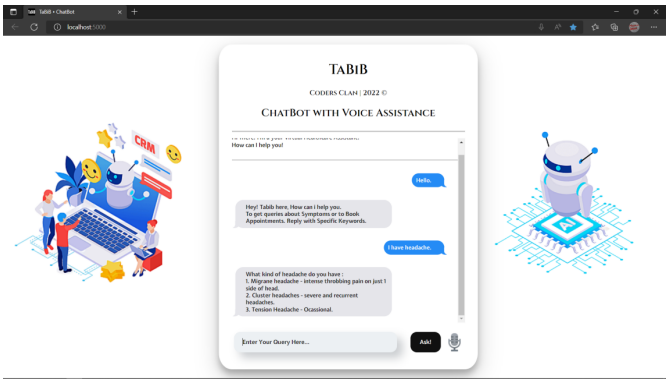

FIGURE 3. Users question on specificsymptom

FIGURE 4. Bots detailed response onusers question

In Figure 5, voice appointment booking is demonstrated, where the user wants to schedule a visit with a doctor and the chatbot inquires about the doctor's area of expertise. When the user says "general doctor," the bot answers with its best recommendation based on its training. As can be seen in Figure 6, the bot queries further about the user's symptoms in order to fully understand the query, then reacts appropriately. As demonstrated in Figure 7 and Figure 8, the chatbot provides information about particular doctors who are close to the

FIGURE 5. **Users intent to book appointment with physician**

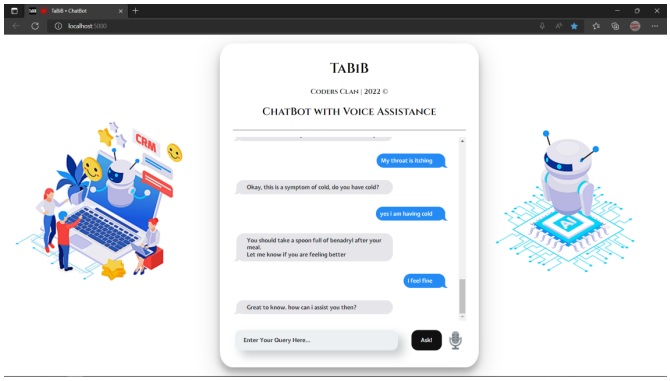

FIGURE 6. **Bot requests user to specify more details about symptom to provide the assistance**

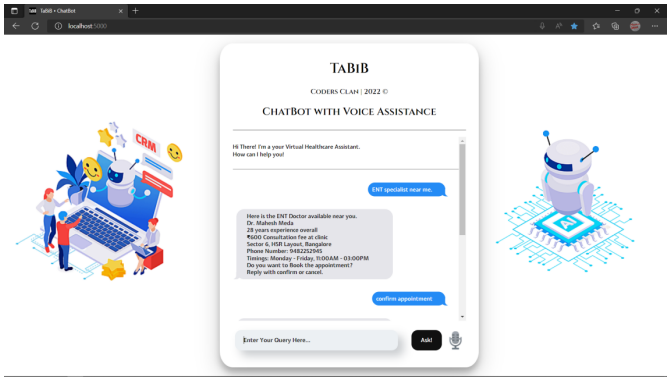

FIGURE 7. **Users intent for ENTspecialist appointment**

FIGURE 8. **Bots confirms appointment based on users confirmation**

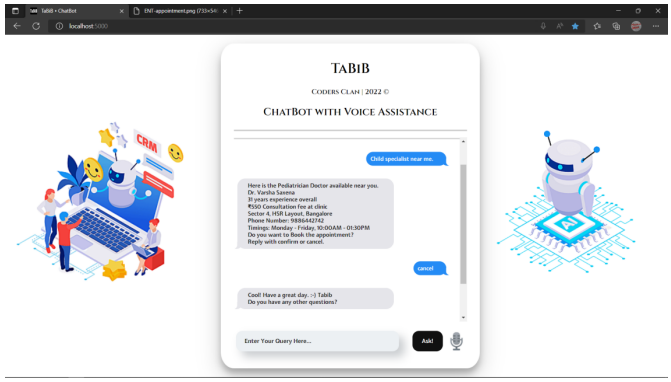

FIGURE 9. **Bots response on no intent of user to book appointment**

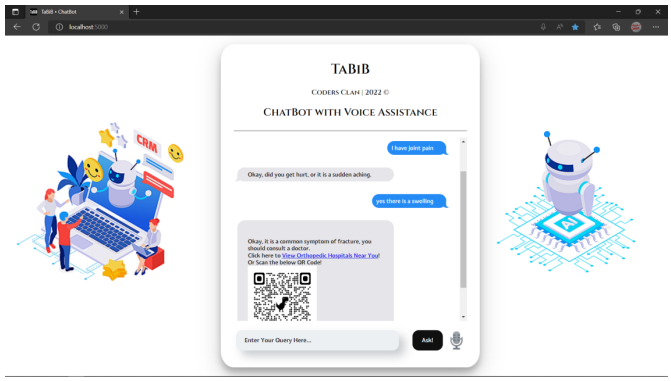

FIGURE 10. **Bot recommends nearby hospitals to user based on users current location**

user's present location, and requests a response to the appointment's confirmation or cancellation. In response, the user says, "Confirm appointment." The bot says "appointment confirmed" and displays the appointment information as an image that may be downloaded for further info. The bot's answer when the user chooses the option to cancel an appointment is shown in Figure 9. Finally, we can see the bot's reaction in Figure 10, where it gives information about hospitals the user can visit nearby based on their present location. The bot generates a link that redirects the user to Google Maps, where the Google interface is customised to provide information on neighbouring hospitals that are close to the user. For the purpose of building a voice enabled medical chatbot, the following tasks were completed: analysis, specification, implementation, design, development and testing.

5. Results

The Rasa interface was used to build this chatbot successfully. We train the chatbot using natural language processing, teaching it the elements it needs to learn in order to appropriately answer the questions. This bot can clearly explain to users what symptoms they are experiencing and what quick actions they need to take. Users can even make appointments with the available doctors in their area. Users can communicate with the chatbot using either a voice or text interface. The voice interface was the major component of the chatbot we created, and it will greatly facilitate the usage of medical chatbots by blind and disabled patients. Because the formerly industry-ready healthcare chatbots are merely text assistants, patients with visual disabilities cannot use them. To create a healthcare chatbot that can be accessed by voice assistants, we used the Talkify API, Web Speech API, and Rasa interface in addition to natural language processing.

6. Conclusion

Through this paper, we created a chatbot that can interact with users and respond to queries in a text- and voice-based interface based on input from users. In this paper, we present a patient-friendly voice-enabled chatbot for managing medical clinics that is designed to provide all the crucial information about a clinic in just one click. The chatbot can only respond to inquiries that are specific to the healthcare system and for which it has an answer in its AIML data set. Future chatbots, powered by AI innovation, will want to remember previous conversations and learn from them in order to answer new ones.

Our bot is named ”TABIB”. The word is derived from Turkish, which means ”Doctor”. The TABIB chatbot was created to address the issues with the text-only interface chatbots that were previously used in the healthcare sector. This prevents individuals who are blind from using the technology by creating a barrier. Therefore, we developed a chatbot that can communicate with users both orally and through text, considerably facilitating the usage of the chatbot by blind people via speech and enabling them to complete tasks at their fingertips. Additionally, the clinical bot provides information about the availability of specialists and access to numerous hospitals close to the user's current location. Assist users in booking an appointment at the best clinic by providing a decision-based adaptable appointment framework powered by AI

Authors' Note

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the pa-per was free of plagiarism.

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