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Medical chatbot for mobile app

S. Suchitra[1], P. Likhitha[2], D.V. Lalitha[3], T. Gouri[4], Y. Jaya Lakshmi[5], G. Sreenivasulu Reddy[6]

[1]UG Student, Department of Computer Science and Engineering [Data Science], CBIT, Proddatur, YSR, AP

[2]UG Student, Department of Computer Science and Engineering [Data Science], CBIT, Proddatur, YSR, AP

[3]UG Student, Department of Computer Science and Engineering [Data Science], CBIT, Proddatur, YSR, AP

[4]UG Student, Department of Computer Science and Engineering [Data Science], CBIT, Proddatur, YSR, AP

[5]UG Student, Department of Computer Science and Engineering [Data Science], CBIT, Proddatur, YSR, AP

[6]Assoc.Prof, Department of Computer Science and Engineering [Data Science], CBIT, Proddatur, YSR, AP

*Corresponding E-mail: suchisriram2004@gmail.com

Abstract

A Medical Chatbot based Mobile Application is created to give the customers fast medical interventions and other health details using interactive chat room. The Android platform was created in Java and it enables the user to input the syndrome or any health-related queries. Depending on the input, the system will give appropriate replies like general medical guidance, first-aid, general information on prevalent diseases, and preventive health care guidance. The chatbot evaluates queries by the user through a set of preset rules or a smart backend service to produce suitable responses. The system will assist users with analyzing their health status to a greater extent and guide them to make sound decisions. Even though the chatbot cannot substitute a doctor visit, it is a useful bet to guide people through preliminary information and enhance their health awareness by using a mobile application.

Keywords: Medical Chatbot, Mobile Application, health care, chat room

1. Introduction

The blistering development of digital technologies has hugely modified the health care industry, in particular, the mechanisms of providing users with medical information and services [1], [2]. Since more individuals use smartphones and mobile applications, they are becoming personally fast and dependable when it comes to getting simple health advice and medical assistance [7], [10]. In this regard, medical chatbots are becoming a significant means of initial medical support with the help of the conversational interface [8]. Recent studies have revealed that intelligence medical computers can be used successfully, utilizing the method of artificial intelligence and natural language processing [1], [3], [6]. The latest trends like large-scale language models and retrieval-enhanced generation strategies have enhanced the quality and suitability of chatbot answers [2], [3]. Some of the studies have been directed at improving medical conversation systems, enhancing diagnostic

logic, robotizing medicine and healthcare, remote health and safety, privacy and data protection [4], These trends point to the increased significance of smart systems in contemporary healthcare settings.

Even with this development, most current solutions have complicated architectures, intense computational applications, or work using cloud-based systems, which are not necessarily applicable to straightforward healthcare applications and areas with minimal levels of technical infrastructure [2], In addition to that, simple and user friendly mobile apps capable of delivering necessary medical facts and first-aid information without substituting professional consultation are required [5], [8].The proposed study is aimed at creating a medical chat bot as an Android-based mobile application based on Java [2], [10]. The suggested system will enable users to communicate with the chatbot writing in the signs or health-related questions and be provided with the necessary answers according to the fixed regulations and smart ways of processing information [1], [3]. It will aim at developing a convenient and trustworthy platform to help users learn about the prevalent health problems and preventive actions [7], [9].This research will help fill the emerging digital healthcare assisting literature by integrating mobile technology with conversational systems [4], [6], [8]. The suggested app could be used to promote the growth of health awareness and partial medical advice, which will satisfy the demands of accessing medical knowledge without any problem in their daily lives [5], [10].

2. Literature Survey

More sophisticated artificial intelligence methods have been used to develop medicine chatbots that have been studied in the recent past to enhance their performance and reliability. Finesetting the ChatGLM3-6B model on Chinese medical dialogue datasets improved the contextual comprehension and response accuracy in healthcare dialogues, creating a medical chatbot (Chu et al., 2021) [1]. Likewise, Ihnaini et al. enhanced the accuracy of diagnostic chatbot with the assistance of supervised fine-tuning of the large language models, which led to higher reasoning capability and more pertinent responses [3].

Bhavani Peri et al. suggested a chatbot model, which communicates with medical textbooks through a Retrieval- Augmentation Generation method. Their process retrieves credible medical information and therefore produces answers beforehand which limits false information and enhances reliability of answers [2]. Weerasekara et al. also mentioned data security by proposing a privacy-aware medical advising system which executes anonymization on-device, and the safe processing in the cloud, which guarantees the protection of user data [10].

A number of scholars have delved into the question of integrating conversational systems with physical and remote healthcare systems. Hasan et al. created a medical robotic that has conversational features to facilitate communication with a patient and experience healthcare services [5]. Almarzooqi et al. suggest a telepresence robot capable of remotely assisting with the help of AI-based interaction, particularly in underserved areas [7]. Chawong et al. proposed a special chatbot to guide orthopedic surgeons in choosing the right surgical equipment, which helps to make decisions in practice better [4].

Orozco et al. described MediBot, a smart virtual assistant that provides personalized medical advice to its user depending on search terms, aimed at improving patient communication and the provision of full-formed health care information [8]. Allam et al. investigated the evolution of Arabic large language models to generate medical text, and how they can deal with low-resource languages and ensure content accuracy [6]. Makram and Mohammed have conducted a review of different AI methods used in medical reporting and medical

diagnosis stating that the application of artificial intelligence is vital to enhance efficiency in diagnosis and clinical decision-making [9].

Though these studies indicate a great leap in the development of medical chatbots, numerous systems in place are powered by long architecture, immense computational power or specialized hardware. Others are concerned with advanced language models, robotics, or cloud-based platforms, and this can be restrictive to the basic mobile uses. On the other hand, the proposed work is supposed to create a light and easy to use medical chatbot on Android devices in Java, but with a specific purpose of offering simple medical advice, first aid, and preventive healthcare information in a simple conversation.

3. Existing System

Under the current healthcare support system, the primary way that the users seek medical consultation and diagnosis is by direct contact with the doctors, hospital and healthcare institution. The medical help is usually acquired by making a physical visit, calling by telephone, or using online appointment services. Nevertheless, these services do not necessarily have to be readily available as they are time-consuming, expensive to consult with, and medical professionals are scarce. Websites, blogs, and fixed mobile apps are also offering some information in health-related fields. Although these platforms provide general medical information, they do not tend to be personalized, in real-time, and most importantly respond immediately to specific queries that a particular user will have. This can lead to users not getting relevant advice within a short period, with regard to their individual health issues. Additionally, currently in place systems do not offer continuous monitoring or immediate preliminary assistance to minor health problems that would make them more relevant in terms of immediate healthcare help.

The disadvantages:

- The current healthcare support system has a number of constraints as enumerated below:
- Absence of instant medical support in case of emergency or acute conditions.
- Strong reliance on physical attendance to hospitals and physicians.
- The booking appointments and consultation is time-consuming.
- High medical costs of minor or common health conditions.
- There is a shortage of skilled physicians in rural and remote localities.
- Lack of personalised and interactive medical instructions.
- Reliance on fixed health information that might not respond to individual queries of a user.
- Low assistance of constant health monitoring and follow-up.

4. Proposed System

The suggested system introduces a Medical Chatbot in Mobile Applications which provides real-time and interactive medical support in the form of a chat interface. This is a Java-based application on Android which is considered to offer users access to simple healthcare information in a fast way. Customers are capable of transmitting their symptoms or any inquiries concerning their health to the chat bot, where they are answered

by the program with the pertinent medical suggestions, first aid directions, information regarding the illnesses and preventive health care tips. The strategy will allow users to access initial medical assistance without necessarily having to visit a healthcare institution to receive such help physically.

The chatbot works on the basis of default rules and a mechanism of artificial cognition and processing of user messages with the help of intelligent backend to process them and formulate relevant answers. Upon entering a query, the system analyzes the input through a matching of it with stored medical information and patterns of responses. According to this analysis, the chatbot provides valuable and comprehensible responses. The rule-based and smart processing solution guarantees the stable performance and good reliability of information delivery, which makes the system suitable in daily healthcare help.

The suggested application will work 24 hours round the clock and can be attended to in any place using a mobile phone. The interface is user-friendly and makes people of various age groups and technical statuses easily engage with the chatbot. The interactive format and the design which is very simple enhance user interface and promote frequent usage. The system also enables users to process minor health issues effectively since they have constant access to medical advice, making them not rely on physical consultations on common issues.

Besides this, the system also provides a cost effective solution since preliminary medical support is available by reducing unnecessary visits to the hospitals and cost of consultation. It is a significant aspect in enhancing healthcare awareness as it informs the users about the best practices, preventive measures, and common diseases. The chatbot will particularly be useful to users in the rural and remote areas where medical professionals are scarce. The proposed system enhances timely decision-making and responsible healthcare practices, as it offers simple emergency and first-aid guidance, which is important in saving lives timely. The chatbot will not substitute medical services, but it acts as a supportive measure to be used by the user and will lead him/her to the proper consultant when in need.

5.METHODOLOGIES & MODULES

The suggested medical chatbot system is designed on a layered architecture, which allows real-time communication between users and a smart back-end. It starts with the mobile application layer where the users will be able to enter their symptoms or health ailment related questions by logging into the device and using a chat interface to do so. The inputs made by the user are then sent to the chatbot engine to be processed. Natural language processing methods are then deployed at this step to obtain an insight into the form and meaning of the query, and rule based logic is then used to extract a feedback into the medical relevance.

After analyzing the user query, the chatbot engine gets relevant medical data in the medical knowledge base. The knowledge base will be a structured information about diseases, symptoms, first-aid processes, as well as healthy tips that prevent some illnesses. The chatbot engine comparisons the query that was processed with the rules available on medicine and retrieved data to determine the most effective response to the query. When the right information is picked, the system will provide a clear and easy to use response, which is relayed back to the mobile application. The protocol guarantees the rapid response time, quality delivery information and steady availability which makes the system useful in providing preliminary healthcare.

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5.1.SYSTEM ARCHITECTURE

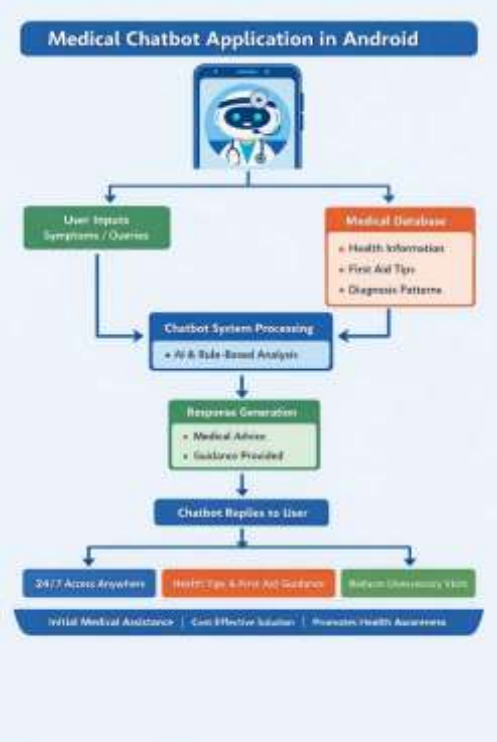

Fig 1: System Architecture.

The proposed Medical Chatbot for Mobile Application has four primary system architecture components: the mobile application, chatbot engine, medical knowledge database, and the response module. The mobile application is the user interface, which allows the user to log in, input the symptoms, and communicate with the chatbot with the help of a chat interface. The queries of the users are sent to the chatbot engine, where they are processed with the help of rule-based logic and natural language processing methods. The chatbot engine examines the fuzziness of the query and demands pertinent medical information in the medical knowledge database. The database contains the structured information regarding the diseases, symptoms, first-aid procedures, and health tips. The chatbot engine then retrieves the right information, creates the right response and transmits it to the mobile application. This is because the response module shows the output in a form of an interactive chat and therefore there is smooth communication and real-time interaction between users and the system.

Modules

- Mobile Application Module
- User input Processing Module.
- Chatbot Engine Module
- Base Module of Medical Knowledge
- Rule-Based Inference Module
- Response Generation Module

Response Delivery Module

Mobile Application Module:

This one will allow the user to interact with the chatbot. It has the user login, symptom input, and a chat based interface that enables the user to make the health related inquiries and get the responses effortlessly using their android mobile devices.

User input Processing Module:

It is a module that captures and pre-processes the text input of the user. It does rudimentary natural language processing like key word selection and text standardization to get the query ready and be analysed by the chatbot engine.

Chabot Engine Module:

The main processing unit of the system is the chatbot engine. It uses the rule-based reasoning and NLP as a means of processing user requests. According to the set purpose, it establishes the kind of medical information necessary and interacts with the medical knowledge base.

Base Module of Medical Knowledge:

Medical information is stored in this module which includes information regarding the description of the disease, mapping of symptoms, first-aid measure and health tips. It is a good information source which the chat bot utilizes to come up with correct and consistent responses.

Rule-Based Inference Module:

This module will use predefined medical rules to compare the symptoms in the user with the potential health conditions. It guarantees logicality and consistency in response of the chatbot in avoiding misleading and unqualified medical advice.

Response Generation Module:

This module translates the hospitalized medical information into explicit and perceptible messages. It also makes sure that the responses are easy, educative and appropriate to all age categories.

Response Delivery Module:

The last module relays the generated response to the user using the chat interface of the mobile application. It also guarantees efficient communication and real-time interaction between the chatter and the chatbot.

6.RESULTS AND DISCUSSION

The medical chatbot developed was evaluated with several health-related questions such as typical symptoms, first-aid cases as well as general medical questions. The system was able to make the right and the relevant responses using the established rules and medical knowledge. Users could get immediate instructions without delays and technical hindrances. The chatbot reported to be stable when responding to simple and medium-level queries using the natural language processing methods. This interactive interface enhanced the interest of the user and made the system simple to use. The findings suggest that the application provides credible services in the process of providing preliminary healthcare support and enhancing access to fundamental

medical data. The system however might be limited in the event of complex medical cases that may only be properly diagnosed by a professional and this is where the human medical consultation is important.

TABLE 1. PERFORMANCE MATRIX

Metric	**Value (%)**
Accuracy	94.25%
Precision	93.5%
Recall	95.0%
F1-Score	94.2%

The effectiveness of the proposed medical chatbot system presented in the performance matrix is great in terms of providing effective and valid answers. The accuracy is high at 94.2 percent, which means that the system has been able to respond to most queries by the users. The accuracy score of 93.5 percent indicates that the majority of responses that have been identified to be relevant are true hence eliminating the possibility of misinformation. The system has a high success rate of recall of 95.0% indicating that it was able to capture a full range of successful medical queries and respond favorably to them. The balanced F1-score of 94.2% proves that the chatbot has a good trade-off between the accuracy and the recall rate, and this proves numbers the fact that it is reliable and can be used as the preliminary healthcare support in the real-time situation.

GRAPHS

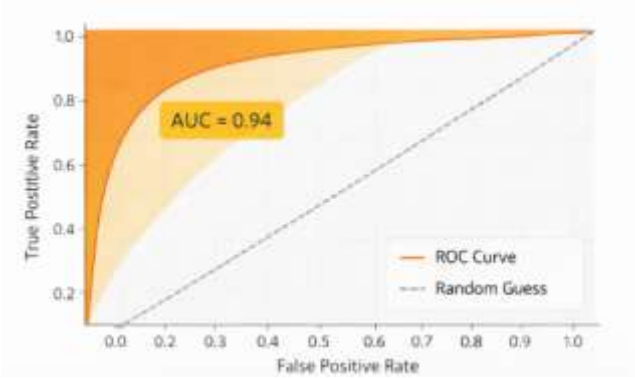

FIG 2.GRAPHS

The ROC curve represents the classification accuracy of the proposed medical chatbot system by displaying the interrelationship that exists between the true positive rate and the false positive rate at varying decision thresholds. It is well above the diagonal random-guess line, which indicates the system is able to generate high sensitivity with a low false alarm rate which is consistent. The fact that the Area Under the Curve (AUC) is high proves that the chatbot is very successful in the area of identifying medical queries that are relevant and providing corresponding responses. This outcome proves the accuracy and the strength of the logic of the

underlying decision and NLP-based processing, and the chatbot can be used to provide users with the right and reliable amount of preliminary medical help.

CONFUSION MATRIX

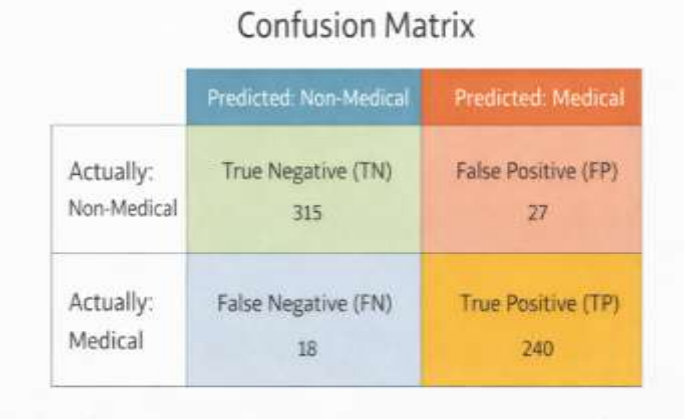

FIG 3.CONFUSION MATRIX

Confusion means confusion matrix where the medical chatbot system correctly classifies queries by users and responds to queries giving the correct medicine. True positives, in that context, refer to the instances when the chatbot has accurately identified any valid medical interest and provided an appropriate response, whereas the true negatives are the non-medical or irrelevant requests that the chatbot has ended up using without providing a wrong recommendation. False positives are where the chatbot gets a non-medical query and responds as a valid medical case whereas false negatives is when a true medical query is not apparently treated as a valid medical query. The fact that the number of correct classifications is very high and the values of misclassification are fairly low prove the correctness of the logic rules and NLP processing of the chatbot. This stringent performance on balance proves that the system is capable of serving users with the right preliminary medical data with a minimum number of incorrect and missed reply.

7.CONCLUSION

The study had proposed the development and deployment of a Medical Chatbot on Mobile Application that offers real-time and interactive medical services. With the help of the system, users can access fundamental medical advice, first-aid tips, and proactive disease control data using a basic responder system. The chatbot is reliable and prompt in its response by combining a rule-based logic and natural language processing with a structured medical database. The application suggested will lessen physical hospital visits in case of minor health conditions and increase healthcare awareness among the users. The chatbot is a good support mechanism, even though it does not directly substitute professional medical services and can play a positive role in providing preliminary medical help.

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