# Medical Mate: Healthcare and Medical Chat Bot

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**Abstract**

The proposed idea is to develop a web-based medical chat bot called "Medical Mate" that will be placed by every patient's bedside, serving as a companion, and providing necessary care and support. It aims to offer convenience and accessibility for patients while easing the workload of hospital staff. Usability tests, employing mixed methods research, were conducted to ensure the chat bot's design and functionalities meet user requirements. Medical Mate pivoted to a web-based application using HTML, CSS, JS, jQuery, and MySQL. Ultimately, the goal of Medical Mate is to be a helpful and reliable companion for patients during their hospital stay, offering care and reducing the burden on medical personnel.

*Keywords*: Healthcare, Chat bot, Medical mate, Graphical user interface

## 1. Introduction

The concept of chat bots has been around for some time, with their main purpose being to engage in conversations with users by responding to their questions based on predefined sets of intents. The vision for Medical Mate is to be a specialized chat bot designed specifically for the medical field, acting as a personal healthcare companion for patients in hospitals. Unlike traditional medical chat bots that offer basic information and customer services, Medical Mate aims to go beyond by providing constant support, companionship, and healthcare advice. It will be available 24/7, offering patients someone to interact with whenever they need it. The chat bot will engage in general conversations and small talk, acknowledging the emotional aspect of healthcare and providing social interaction for patients during their hospital stay.

Additionally, Medical Mate will leverage AI, ML, NLP, and NLU to offer healthcare guidance and serve as a communication facilitator between patients and medical staff. The inclusion of food ordering functionality aims to add convenience, while special attention is given to assisting introverted patients, providing a non-judgmental environment for them to communicate and access healthcare information comfortably. The overall goal is to enhance patient experience, promote engagement, and optimize healthcare delivery within the hospital setting [1], [8].

Existing chat bots in the medical field are limited in functionalities, often focused on basic tasks like customer service and simple health diagnostics. There is a need for improvement to create a more comprehensive system that can cater to a larger number of patients, providing better assistance and companionship during their hospital or clinic visits. The challenge lies in ensuring advanced and well-trained Natural Language Processing (NLP) to avoid misinterpretation of user questions and prevent providing false or irrelevant responses. Additionally, some chat bots lack appealing graphical user interfaces (GUI) and intuitive navigation, which may lead to disengaged users, particularly those unfamiliar with technology or older generations not exposed to such systems. Creating a user-friendly and visually appealing interface is essential for successful chat bot adoption [5].

This study aims to develop a new chat bot application system for hospitals or clinics (medical field) which will focus on being the patient's personal healthcare assistance or companions but can also be used by doctors to update patient's details. The chat bot for hospital or clinics aims to understand its patients and to provide the best responses about their current health. A chat bot can be implemented at every side of the bed to reduce human

efforts so that not all nurses or doctors have to be present in the room unless of emergency. The chat bot is also available every hour so patients can access them whenever they need assistance or companions.

## 2. Review of Literature

The idea of chat bots originated with Alan Turing in 1950, who pondered whether machines could think like humans. With the rise of Artificial Intelligence (AI), conversational systems gained attention, and chat bots emerged as natural language user interfaces for data providers. The first-ever chat bot, "ELIZA," was created in 1966 by Joseph Weizenbaum, scanning user input for keywords to provide relevant responses. It was later improved and enhanced by Kenneth Colby, becoming "PARRY." Decades later, Richard Wallace developed the chat bot A.L.I.C.E, utilizing artificial intelligence markup language (AIML) for more advanced and improved responses to user queries [2], [3].

### 2.1. Types of Chat Bot

In the current technological era, there are three main types of chat bots: Menu/Button-based, Keyword Recognition-based, and Contextual Chat Bots. Menu/Button-based chat bots are basic and limited, offering pre-defined options for users to select. They are easy to use but may not provide accurate or personalized responses. Keyword Recognition-based chat bots use NLP algorithms to identify specific keywords in user input and can handle more complex questions, but they may still struggle with full message understanding and misinterpretation. Contextual chat bots are technologically advanced, utilizing AI, ML, and NLP to fully understand user input, learn from interactions, and provide personalized responses. However, they are expensive and complex to develop and maintain [4].

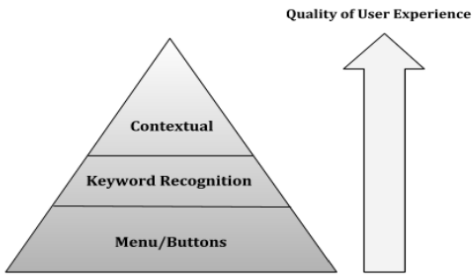


Fig. 1. Preference of chat bots

We can conclude from Fig. 1, that contextual chat bots provide a superior user experience compared to menu/button-based chat bots. Their sophistication and advanced capabilities allow them to answer complex user questions effectively. In contrast, menu/button-based chat bots are limited in dialogue and cannot handle intricate inquiries, resulting in a less enjoyable user experience [4].

### 2.2. Adoption of Chat Bots

The adoption of chat bots has significantly increased in various industries, transforming tasks and customer service. Businesses and organizations use chat bots as virtual personal assistants to assist customers with general inquiries, simplifying tasks and providing help 24/7. Chat bots can learn from vast amounts of data, known as big data, allowing them to understand patterns in user interactions and offer personalized responses. Advanced chat bots use machine learning to collect and analyse data, enhancing their decision-making algorithms and increasing efficiency and productivity. Their 24/7 accessibility and ability to handle multiple conversations at once make them cost-effective for businesses, reducing the need for additional customer service staff. While chat bots have advantages, they are best suited for handling simpler inquiries, and more complex questions may still require human intervention. Businesses can continue to improve customer experiences by enhancing chat bot capabilities and leveraging their ability to learn from big data. Chat bots are very common in a lot of industries these days [4], [6]. Table 1 illustrates examples of chat bots in different industries and their specific functionalities.

Table 1. The planning and control components

| Chat bots | Functionalities |
|---|---|
| Online shopping | Personalized recommendation, reply to customers with basic information until owner is online, available 24/7 |
| Education | Teach users and provide resourceful information, 24/7 availability for students to ask questions. |
| Customer service | Reply customers with basic information until someone is available to entertain them, available 24/7 |
| Banking | Customer service 24/7 and can query any information regarding their bank details |
| Virtual assistant (phone) | Carry out simple task and provide the best possible answer, can be user's friend whenever they feel bored |
| healthcare | Provide basic healthcare advice, scheduling doctor's appointment, managing medications and prescriptions |
| Travelling (airlines) | Help manage customers flight, basic customer services |

In summary, chat bots offer a convenient and efficient way for users to obtain information through voice and text recognition skills. They provide quick and helpful responses, making them cost-effective for businesses compared to hiring human customer service workers. Chat bots offer 24/7 availability, handle multiple conversations simultaneously, and use big data to provide personalized recommendations and solutions [7]. They are easily scalable to meet growing demand without sacrificing quality. Overall, chat bots simplify user experiences, improve customer satisfaction, and have the potential to transform various industries as technology continues to advance and they continue to learn and adapt.

### 2.3. Human Computer Interaction (HCI)

In recent years, Human-Computer Interaction (HCI) has made significant advancements, particularly in the design of Graphical User Interfaces (GUIs). HCI focuses on the interaction between humans and computers, and it plays a crucial role in the development of programs or applications that require GUIs [12], [13]. GUIs are essential for simplifying the interaction between users and various digital devices, and they must be designed with HCI principles in mind to ensure usability and user-friendliness. HCI becomes even more important when creating chat bots, as it facilitates natural and intuitive conversations between users and the system. HCI professionals use various disciplines to understand user requirements and preferences, incorporating these insights into interface design to enhance the user experience. In conclusion, a well-designed GUI is crucial for HCI, and it is considered the future of technology companies, especially in the context of chat bots and natural language interactions [2], [9].

### 2.4. Chat bots in the medical and healthcare industries

Chat bots offer valuable solutions to the challenges of accessing mental health services, providing instant help and support with increased efficiency. They can enhance empathy through human-like interactions, improving therapeutic effects and treatment plan compliance. Healthcare-focused chat bots improve user engagement and usability, offering convenient and personalized interactions for individuals who may find traditional healthcare methods intimidating. By providing 24-hour availability and more human-like automated messages, chat bots address accessibility issues and offer a promising avenue for efficient and effective healthcare support, potentially revolutionizing healthcare service delivery [7], [8], [10].

## 3. Methodology

Data gathering and prototype creation were conducted, followed by testing among chosen participants to gather feedback for improving the design and knowledge proficiency of the chat bot. Test scenarios included asking random questions to assess response time and accuracy of the chat bot. The research approach chosen for the development of the medical chat bot, Medical Mate, is mixed methods research, which combines both quantitative and qualitative research methods. Quantitative research focuses on discovering patterns and trends using numerical data, while qualitative research seeks to understand people's experiences and perspectives through verbal or narrative data [11]. The aim of the research is to obtain feedback on the chat bot's interface, conversation ability, and overall usefulness. By using both quantitative and qualitative methods, a comprehensive understanding of the chat bot's performance and user experience can be achieved. The data collection will be split into 2 different approaches, and these are focus group interview and questionnaire survey.

### 3.1. How does a chat bot work

A chat bot functions by processing user input and attempting to match it with the most appropriate intent from its predefined set. In the case of Medical Mate, it has a predefined set of intents stored in a Json file, which it uses to train for keyword-recognition. This allows Medical Mate to identify users' input and provide the best possible response based on the identified keywords.

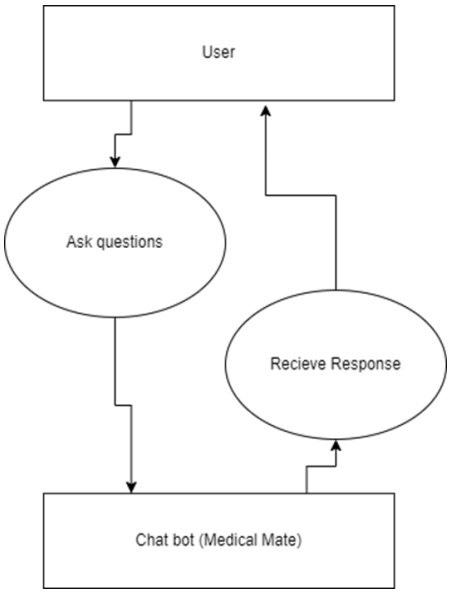


Fig. 2. Chat bot use case diagram

A simple use case diagram (Fig. 2) representing the design of the Medical Mate. This use case diagram also shows interaction between user and the Medical Mate. This diagram shows that the user input which is to ask the chat bot questions and it will process the questions and identify the keyword to provide a response to the user when it is done.

## 4. Discussion

Medical Mate, being a prototype, has some acknowledged limitations. These limitations include a restricted set of features and functionalities and an incompletely trained chat bot. However, the research methodologies and continuous user testing employed during its development have provided valuable insights into user experience and feedback. Despite its current limitations, Medical Mate has been instrumental in gathering valuable information about user interactions and perceptions. It is primarily a keyword-recognition based chat bot with a predefined set of intents used to provide responses to users. Additionally, the chat bot is programmed using php and MySQL instead of python, which further contributes to its limitations.

## 5. Conclusion

The research findings demonstrate the potential and benefits of a medical chat bot system like Medical Mate. Participants found the chat bot to be a good idea with room for improvements. The system was praised for its user-friendly design and ease of navigation. Medical Mate's aim to answer medical questions, provide companionship, and assistance was well-received by users. To further enhance its performance, integrating Python programming and comprehensive training with datasets is recommended. The ultimate goal is for Medical Mate to become a reliable and intelligent healthcare companion for patients, reducing human workload and improving the overall hospital experience. The hope is that with continuous development and improvements, Medical Mate can achieve its purpose and become an indispensable tool in the medical field.

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## Authors Introduction


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