Medibot

An AI powered chatbot

Nishita Rai
Jaypee Institute Of Information Technology, Noida
9921103068@mail.jiit.ac.in

Smriti Sharma
Jaypee Institute Of Information Technology, Noida
9921103013@mail.jiit.ac.in

Saumya Bansal
Jaypee Institute Of Information Technology, Noida
9921103077@mail.jiit.ac.in

Himani Bansal
Jaypee Institute Of Information Technology, Noida
singal.himani@gmail.com

ABSTRACT

In today's fast-paced healthcare landscape, the demand for accessible, efficient, and personalized medical assistance is rapidly increasing. However, healthcare professionals often face challenges providing round-the-clock patient support during busy schedules. This leads to difficulties in promptly addressing inquiries and disseminating accurate information and may encounter obstacles in accessing timely medical advice, especially during non-office hours or in remote locations.

To bridge this gap and enhance healthcare accessibility, developing a Language Model (LLM) trained chatbot tailored specifically for healthcare purposes is essential. This chatbot is designed to provide users with a reliable platform for seeking medical advice, information about symptoms, medication queries, and general healthcare guidance. By leveraging advanced natural language processing capabilities, the chatbot aims to address the needs of both healthcare professionals and patients alike.

CCS CONCEPTS

• **Large language models**; • **Artificial Intelligence**; • **Medical Chatbot**;

KEYWORDS

Medical queries, Digital consultation, Interactive Messaging, Patient care

ACM Reference Format:
Nishita Rai, Smriti Sharma, Saumya Bansal, and Himani Bansal. 2024. Medibot : An AI powered chatbot. In *2024 Sixteenth International Conference on Contemporary Computing (IC3-2024) (IC3 2024), August 08–10, 2024, Noida, India.* ACM, New York, NY, USA, 5 pages. https://doi.org/10.1145/3675888.3676136

1 INTRODUCTION

In the digital age, technological advancements have transformed numerous facets of daily life, profoundly impacting industries across the board, including healthcare. The integration of innovative solutions, particularly chatbots powered by Large Language Models (LLMs), represents a pivotal development with the potential to revolutionize healthcare accessibility and efficiency. This introduction delineates the significance of leveraging LLM technology to develop a sophisticated healthcare chatbot, addressing the growing demand for personalized medical assistance, information dissemination, and guidance in the contemporary healthcare landscape.

The chatbot serves as an accessible and efficient tool for patients to obtain accurate medical information and guidance, regardless of their location or the time of day. It can assist users in assessing symptoms, understanding treatment options, and obtaining general healthcare advice, thereby empowering individuals to make informed decisions about their health.

For healthcare professionals, the chatbot offers support by handling routine inquiries, thereby allowing them to focus on more complex tasks and patient care. Additionally, the chatbot can serve as a knowledge repository, providing healthcare professionals with quick access to up-to-date medical information and guidelines.

Overall, developing trained chatbots holds promise forfor improving healthcare accessibility and efficiency. By leveraging advanced technology, it has the potential to streamline communication between patients and healthcare professionals, facilitate timely access to medical advice, and ultimately enhance the quality of care provided to individuals worldwide.

1.1 Significance of Technological Advancements in Healthcare

The advent of digital technologies has ushered in a new era of healthcare delivery, characterized by enhanced accessibility, efficiency, and patient-centered care. From telemedicine platforms facilitating remote consultations to wearable devices monitoring vital signs, technological innovations have democratized healthcare, transcending geographical barriers and empowering individuals to take proactive control of their well-being.

Furthermore, the proliferation of smartphones and internet connectivity has catalyzed the evolution of healthcare services, enabling seamless communication between patients and healthcare providers. Consequently, there is a burgeoning need to harness the potential of emerging technologies to augment healthcare delivery, streamline administrative processes, and improve patient outcomes.

IC3 2024, August 08–10, 2024, Noida, India

ACM ISBN 979-8-4007-0972-2/24/08
https://doi.org/10.1145/3675888.3676136

1.2 Emergence of Chatbots and Large Language Models

Among the myriad technological innovations reshaping the healthcare landscape, chatbots powered by Large Language Models (LLMs) have garnered considerable attention for their transformative potential. LLMs, such as OpenAI's GPT (Generative Pre-trained Transformer) series, are state-of-the-art artificial intelligence models trained on vast datasets of human language, enabling them to comprehend and generate human-like text with remarkable accuracy and coherence.

In the realm of healthcare, LLM-powered chatbots offer a versatile platform for delivering personalized medical assistance, disseminating accurate information, and facilitating seamless communication between patients and healthcare professionals. By leveraging natural language processing (NLP) algorithms, these chatbots can interpret user queries, discern intent, and generate contextually relevant responses, thereby enhancing the overall user experience and efficacy of healthcare interactions.

1.3 Challenges in Healthcare Accessibility and Efficiency

Despite the transformative potential of LLM-powered chatbots, the contemporary healthcare landscape is fraught with challenges that impede accessibility and efficiency. Healthcare professionals often grapple with overwhelming workloads, limited resources, and disparate communication channels, hindering their ability to deliver timely and personalized care to patients.

Similarly, patients encounter barriers to accessing healthcare services, including long wait times for appointments, geographical constraints, and disparities in healthcare infrastructure. Moreover, the proliferation of misinformation and inaccurate medical advice on online platforms exacerbates the challenge of obtaining reliable healthcare information, leading to confusion and suboptimal health outcome.

2 BACKGROUND STUDY

2.1 Overview

We delved into the foundational aspects relevant to our project, focusing on the evolution of generative AI and a comparative analysis of existing healthcare websites. Understanding the historical context and current landscape of healthcare provides essential insights for the development of our LLM-based chatbot.

2.2 Literature Review

The research paper [1] explores the application of Reinforcement Learning from Human Feedback (RLHF) in fine-tuning Large Language Models (LLMs) for a specific field, particularly in psychology and mental health. The study aims to investigate whether RLHF can effectively specialize an LLM to act as a virtual psychologist assistant, providing tailored responses to individual patients. The project is part of a larger initiative to develop a Cognitive Behavioral Therapy-aimed AI chatbot specialized in psychology.

The authors highlight the rapid growth of machine learning and AI, particularly in Natural Language Processing (NLP), which has led to the development of tools such as ChatGPT and large language models. RLHF emerges as a novel method for fine-tuning LLMs, using human feedback to improve model performance and adaptability to specific tasks.

Ethical considerations are emphasized, especially in the sensitive field of psychology. The potential risks associated with text generation and assisting technologies, including toxic language and biased data, are discussed. Additionally, the issue of accountability and responsibility for the actions of AI-powered psychological assistants is raised, posing challenges similar to those faced in fields like robotic surgery and self-driving cars.

The study sets scientific questions to examine the impact of RLHF on LLM responses regarding mental health and explores ethical implications and regulatory frameworks for implementing AI in psychological practice. The evaluation of results is expected to be qualitative, focusing on criteria such as support, insight, impartiality, and respect. Psychology students from Karolinska Institutet (KI) and Stockholm University (SU) will participate in evaluating the LLM responses through surveys.

Trustworthiness holds significant weight in the academic AI discourse [2], with concerns about misrepresentation of basic facts or concealed biases highlighting the substantial need for improvement in this area. As a collective of clinicians and scientists operating within a clinical nuclear medicine setting, we question the reliability of the nuclear medicine content currently generated by ChatGPT. An essential benchmark in the training of any medical practitioner is the comprehensive board or licensing examination. These assessments serve the purpose of safeguarding the public by ensuring physicians are accountable, evaluating them based on a defined knowledge base, and upholding public confidence by adhering to professional standards. In tort law, determining what constitutes negligent practice often involves referencing the knowledge and practices of a professional community in common law jurisdictions. If AI tools are to potentially aid or even supplant physicians, their performance may be held to a comparable standard.

Accurately identifying texts generated by large language models (LLMs) [3] is crucial for unlocking the complete potential of natural language generation (NLG) while mitigating potentially severe outcomes. From the viewpoint of end users, detecting LLM-generated text could enhance confidence in NLG systems and promote their acceptance. For developers and researchers of machine learning systems, such a detector can assist in tracking generated texts and averting unauthorized usage. Due to its importance, there has been an increasing interest both in academia and industry to delve into research on LLM-generated text detection and to further comprehend its fundamental workings.

In summary, the research paper aims to explore the potential of RLHF in specialized applications of LLMs, particularly in psychology and mental health. It addresses ethical considerations and scientific questions to evaluate the effectiveness and implications of using AI-powered psychological assistants in clinical practice.

3 DETAILED DESIGN

In the digital age, technological advancements have transformed numerous facets of daily life, profoundly impacting industries across the board, including healthcare. The integration of innovative solutions, particularly chatbots powered by Large Language Models

(LLMs), represents a pivotal development with the potential to revolutionize healthcare accessibility and efficiency. This introduction delineates the significance of leveraging LLM technology to develop a sophisticated healthcare chatbot, addressing the growing demand for personalized medical assistance, information dissemination, and guidance in the contemporary healthcare landscape.

3.1 Introduction

In this section, we'll outline the comprehensive design considerations for our AI chatbot integrated with Langchain's generative AI framework. By delving into the technical specifications and design elements, we aim to provide clarity and guidance for the development team to create a robust and user-friendly chatbot solution.

3.2 System Architechure

3.2.1 Client Tier: Web-based Client for Desktop Users:

1. The chatbot features a user-friendly web-based interface accessible across devices.

2. Development employs HTML, CSS, and Bootstrap for frontend design, ensuring responsiveness and visual appeal.

3. Flask[4] is utilized for server-side logic, providing a lightweight and scalable backend framework for handling user requests.

3.2.2 Application Tier: Generative AI Framework with Langchain Integration:

1. The application tier leverages Langchain's generative AI framework for natural language processing and text generation.

2. Langchain's blockchain technology ensures secure transactions and incentivizes contributions within the chatbot ecosystem.

3.2.3 Data Tier: Vector Database (e.g., Chroma):

1. For efficient storage and retrieval of contextual embeddings and user interactions, the chatbot integrates with a vector database such as Chroma.

2. Chroma's indexing and similarity search capabilities enable fast and scalable data access, crucial for real-time chatbot responses.

3.3 Database Design

This section provides insight into how the Chroma database is organized and used. It also includes the various tables and the overall structures in which all the data is stored.

3.3.1 User Interaction Database: 1. A database table stores user interactions, including messages, queries, and responses, along with relevant metadata.

2. Contextual embeddings generated by the AI framework are stored alongside user interactions for enhanced conversational continuity.

Figure 1 depicts the flow of the whole process.

3.4 Functional Design

3.4.1 Chatbot Capabilities:

Natural Language Understanding (NLU):. 1. The chatbot employs advanced NLU techniques to comprehend user intents, entities, and context within conversational inputs.

2. Meta LLAMA 2's deep learning capabilities enable accurate parsing and interpretation of user queries, enhancing conversational understanding.

Contextual Conversation Management: 1. The chatbot maintains contextual awareness throughout conversations, allowing for seamless transitions between topics and queries.

2. Contextual embeddings generated by Meta LLAMA 2 are utilized to preserve conversation history and context for more coherent interactions.

Dynamic Response Generation: 1. Responses generated by the chatbot are dynamic and contextually relevant, incorporating user preferences, historical interactions, and real-time data.

2. Generative AI's capabilities enable the chatbot to produce diverse and engaging responses tailored to individual user queries and preferences.

3.5 User Interface (UI) Design:

Responsive Design:

1. The chatbot interface features responsive design principles, ensuring seamless user interaction across desktop and mobile devices.

2. Bootstrap components enhance UI consistency and usability, facilitating intuitive navigation and engagement.

3.6 Testing Strategy

3.6.1 End to End Testing: Comprehensive Test Scenarios:

1. End-to-end testing encompasses critical user workflows, including user registration, conversation initiation, and transactional interactions.

2. Test scenarios evaluate chatbot responses, contextual understanding, and integration with Langchain's incentivization mechanisms.

3.6.2 Integration Testing: Langchain and Chroma Integration Testing:

1. Integration tests validate seamless interaction between the chatbot, Langchain's blockchain network, and Chroma vector database.

2. Scalability, performance, and data consistency across integrated components are thoroughly tested to ensure reliability and robustness.

4 EXPERIMENTAL RESULTS AND ANALYSIS

This section presents a thorough examination of the experimental results obtained from the implementation of Medibot. It aims to display the overall UI/UX, various functionalities, and efficacy of the platform.

4.1 Introduction

In this section, we'll outline the comprehensive design considerations for our AI chatbot integrated with Langchain's generative AI framework. By delving into the technical specifications and design elements, we aim to provide clarity and guidance for the development team to create a robust and user-friendly chatbot solution.

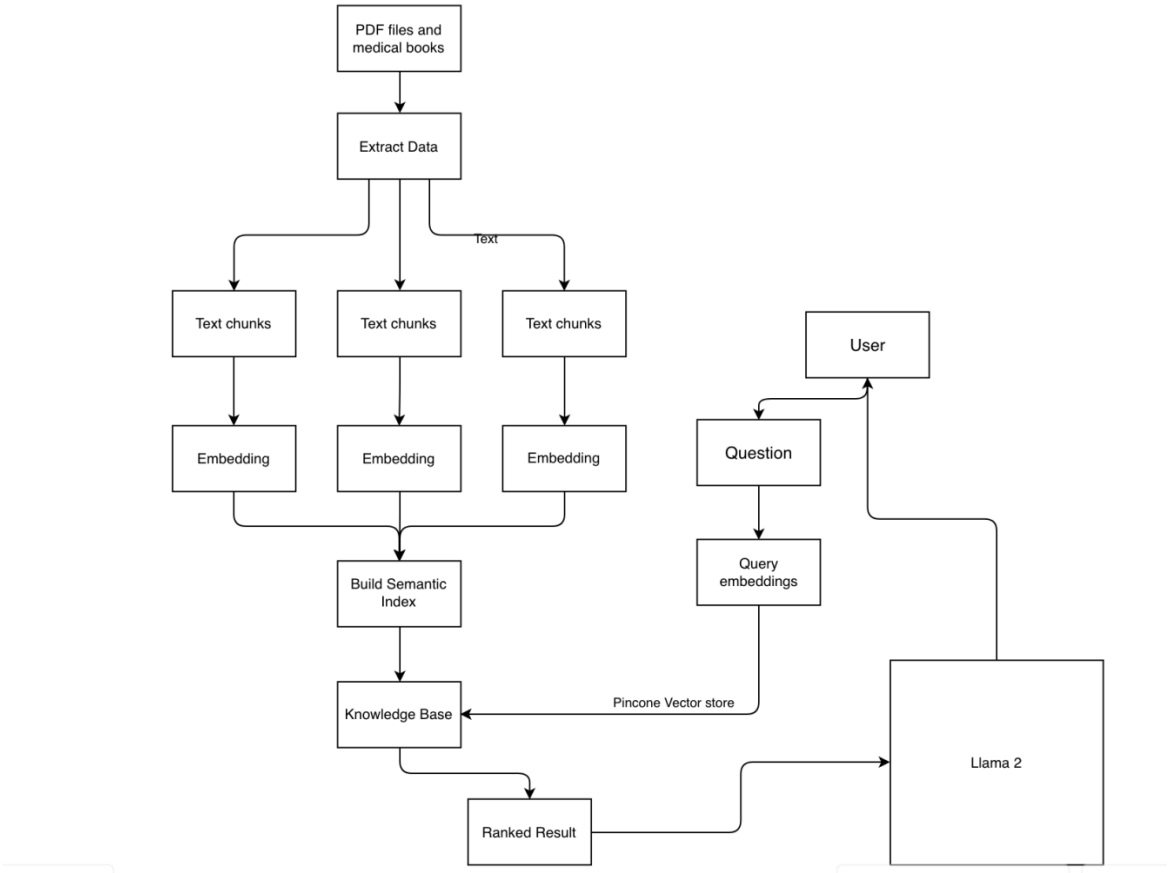

Figure 1: Flow Diagram

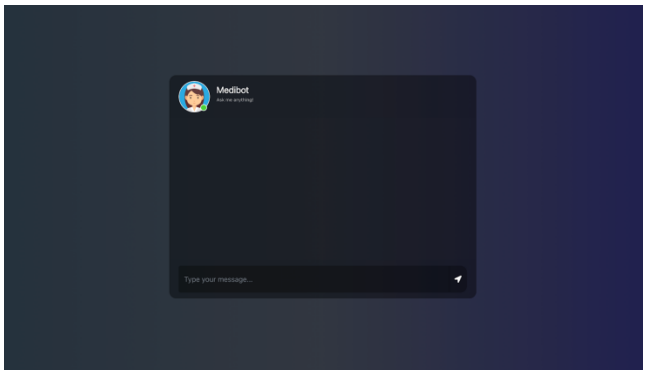

Figure 2: Chatbot

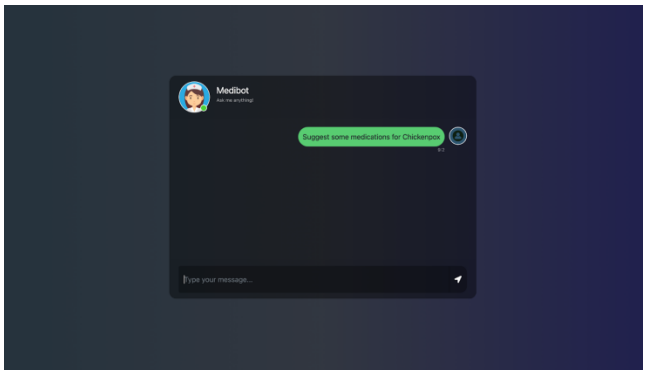

Figure 3: Inputting prompts

Figure 2 shows the GUI of the Chabot, and Figure 3 shows one of the input prompts. Figure 4 and Figure 5 showthe generated replies to the input prompts.

5 CONCLUSION AND FUTURE SCOPE

In conclusion, our journey towards creating a sophisticated and user-centric AI chatbot solution has been marked by a dedication to excellence at every stage of development. From the integration of advanced natural language understanding to the crafting of dynamic response generation, we have strived to ensure that

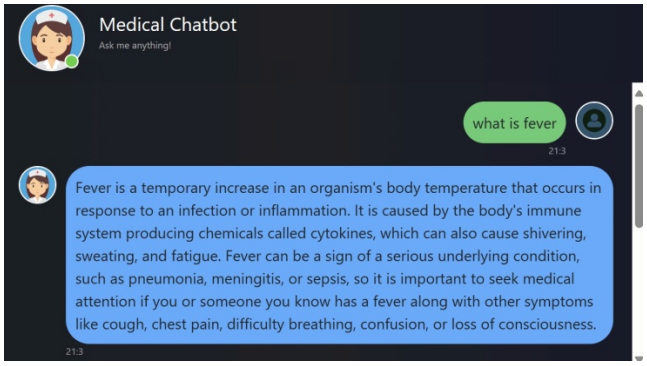

Figure 4: Generated Reply for Basic Questions

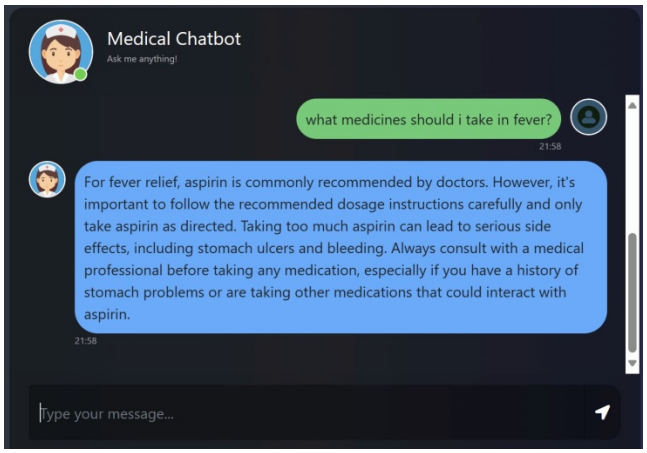

Figure 5: MediBot: Your local Medical Chatbot

our chatbot offers an unparalleled conversational experience. Our commitment to leveraging state-of-the-art technologies and adhering to industry-leading practices has resulted in a platform that not only meets but exceeds the expectations of users in terms of security, intuitiveness, and seamlessness.

Looking ahead, the future scope of our project is promising and multifaceted. We aim to further enhance the conversational capabilities of our chatbot, making interactions even more engaging and personalized for users. By implementing advanced dialogue management techniques and enriching responses with contextually relevant information, we will continue to elevate the overall user experience. Additionally, we plan to focus on deployment strategies to ensure the scalability and reliability of our platform, exploring cloud deployment and containerization options for efficient resource utilization.

Furthermore, our future enhancements will extend the utility of our chatbot across diverse domains and user demographics. Integration with electronic health record (EHR) systems will enable access to patient medical history and records, facilitating personalized healthcare recommendations through advanced machine learning techniques. Moreover, the expansion of language support will ensure inclusivity and accessibility for users from diverse linguistic backgrounds, reaffirming our commitment to catering to the evolving needs and preferences of our user base. Through ongoing refinement and iterative improvement based on user feedback, we are confident that our project will continue to thrive and remain relevant in the dynamic landscape of AI-driven interactions.

REFERENCES

[1] D. Bill and T. Eriksson, 'Fine-tuning a LLM using Reinforcement Learning from Human Feedback for a Therapy Chatbot Application', Dissertation, 2023.
[2] Alberts, I., Mercolli, L., Pyka,'Large language models (LLM) and ChatGPT: what will the impact on nuclear medicine be?', Eur J Nucl Med Mol Imaging 50, 1549–1552 (2023)
[3] Ruixiang Tang, Yu-Neng Chuang, Xia Hu,'The Science of Detecting LLM-Generated Texts',Cornell University, Feb 2023