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AI-HealthCare Chat-Bot System

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Abstract — *Healthcare plays a vital role in maintaining a good quality of life, yet accessing medical consultations for every health concern can be challenging. To address this issue, there is a proposal to develop an AI-powered medical chatbot capable of diagnosing diseases and offering preliminary information before patients consult a doctor. This innovation aims to reduce healthcare expenses and enhance access to medical knowledge. Chatbots, which utilize natural language processing, will store data in a database to identify relevant keywords, make informed decisions, and respond to user queries. Techniques such as n-gram, TFIDF, and cosine similarity will be employed to rank and determine sentence similarity, ensuring accurate responses. The project adopts the Llama-2 framework for its advanced capabilities in natural language comprehension, knowledge representation, and reasoning, with the goal of creating an intelligent chatbot capable of providing comprehensive medical guidance and assisting patients throughout their healthcare journey.[1] Additionally, the study explores the advantages of integrating chatbots, including real-time support, 24/7 availability, and personalized recommendations, to improve healthcare accessibility and support services.*

***Keywords*- Flask, python, C transformer, chatbot, NLP, I, Llama-2**

I -INTRODUCTION

The project name is HealthCare Chat-Bot System. The HealthCare Chat-Bot System seeks to tackle the present hurdles encountered by the healthcare sector, such as restricted availability of medical knowledge, Long appointment waiting time, and the requirement for effective communication platforms between patients and healthcare practitioners. Conventional healthcare delivery methods frequently find it challenging to fulfill the increasing need for accessible, prompt, and patient-centric care.

The primary objective of the initiative is to bridge the language barrier between users and healthcare providers by offering prompt responses to user inquiries. Nowadays, people are increasingly reliant on the internet but often neglect their personal health, opting to avoid hospitals even for minor issues that could develop into serious ailments over time. Setting up question-answer platforms provides a straightforward method to address these queries, rather than sifting through extensive web documents. However, many current systems have limitations, such as delays in receiving instant responses, as patients often have to wait for acknowledgment from experts for extended periods.

Chatbots, powered by advanced natural language processing (NLP) and knowledge representation techniques, have the potential to revolutionize the way healthcare services are delivered and accessed.

The use of the Llama-2 framework in this healthcare chatbot project is particularly significant due to its advanced capabilities in knowledge representation and reasoning. Llama-2 enables the chatbot to understand complex medical queries, interpret clinical guidelines, and make informed decisions based on the available knowledge base. By leveraging these capabilities, the chatbot can provide accurate and reliable responses to user queries, leading to improved patient outcomes and satisfaction.

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II. LITERATURE REVIEW

The paper gives information regarding products that are useful for consumers to obtain precisely what they want. Question Answering (QA) systems can be identified as information accessing systems that attempt to respond to natural language queries by providing suitable answers, leveraging attributes available in natural language techniques. In this context, the Linguistic Landscape of Medical Advice (LLaMA-2) framework emerges as a valuable tool for enhancing the effectiveness of QA systems in the healthcare domain. LLaMA-2 offers a comprehensive linguistic landscape that enables QA systems to understand and respond to medical queries with greater accuracy and relevance. By incorporating LLaMA-2 into healthcare chatbots, developers can harness its linguistic patterns, semantic categories, and discourse structures to deliver more contextually relevant and informative responses to users seeking medical advice and information. In this project we used LLaMA-2 model, these is fine-tuned version, Llama 2-Chat, proves invaluable in enhancing healthcare accessibility. AI-driven chatbots and virtual assistants powered by Llama 2-Chat provide patients with round-the-clock access to medical advice, symptom triage, appointment scheduling, and health information. This democratizes healthcare by reaching patients in remote or underserved areas. increases context length from 2K (Llama 1) tokens to 4K (Llama 2) tokens between. The user inputs a question or query into the system. Query Embedding: The question is converted into a query embedding, which is a numerical representation of the text suitable for processing by machine learning models. Knowledge Base (KB): The query embedding is sent to a knowledge base containing a vast amount of data or vectors relevant to the user's query. The KB returns ranked results based on the similarity between the query embedding and the stored data. Ranking Results: The ranked results from the knowledge base are returned to the system. These results are typically ordered based on their relevance to the user's query. Integration of LLaMA-2: LLaMA-2, a large language model, is integrated into the system. LLaMA-2 is used to further refine the query and filter the results obtained from the knowledge base. Filtering and Refinement: LLaMA-2 processes the query and filters the ranked results from the knowledge base. It helps identify the most relevant information and refines the results to provide more accurate responses to the user's question. Response to User: The filtered and refined results are presented to the user as the system's response to their question. This response is based on the combined processing of the query by the knowledge base and LLaMA-2.[5] This application can be developed by using programming language of Python, Lang chain: -Generative AI Framework, flask for frontend, vector DB: - pinecone, LLaMA-2 model. Paper uses artificial intelligence for predict the diseases based on the symptoms and give the list of available treatments. It can facilitate us to figure out the problem and to validate the solution. processing and generating a response using the LLaMA-2 framework, author use a text-to-speech (TTS) system like Google Text-to-Speech or Amazon Polly to convert the text-based response into natural-sounding speech, making it easier for users to interact with the healthcare chatbot.

III. METHODOLOGY

The research methodology used for this work describes how the project will be developed. Therefore, the methodology used in the design and collection of information from various sources is as follows:

- Study in detail LLaMA-2 model, AI concept
- Know and understand concept of Generative AI, and working of chatbot.
- To understand the mode of operation of the old system, Primary data: This source has to do with the text book contacted for the development of this project.

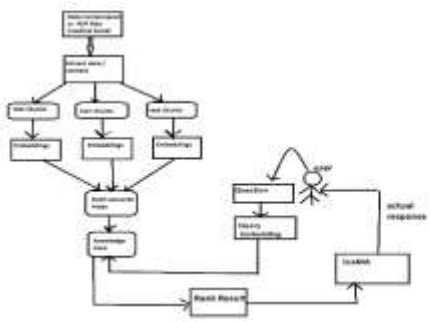

Figure 1 Architecture of Chatbot

IV. DESIGN

This system helps users to submit their complaints and queries regarding the health. Customer satisfactions the major concern for developing this system. [2] The actual welfare of the chatbot is the facilitate the people by giving proper guidance regarding the good and healthy living. For the reason that many of the people do not have fundamental awareness of physical condition. Some people live for years with debilitating but they do

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not pay attention to symptoms simply because they think they don't require a doctor. The working of the system is as follow:

A. User Login to System: User registers on Chatbot application. Then ask queries regarding to the health care and medical details. *[3]*

B. Ask some Questions: You can ask some questions regarding some healthcare. And its related to voice- text and text-voice conversation. Using Google API for inter conversion of text-voice and vice versa. *[4,8,9]*

C. Age based Medicine dosage details: You can ask medical dosage related queries to this app in voice and system gets output for medicine API and speak out and display all data. Get your age from registration data and provide data related to your data like age, area, gender and so on. *[9]*

Give me age Then predict disease using SVM Algorithm.

D. Get Medicine Details on medicine name: You can ask about medicine related details on the basis of medicine names.

E. Disease Prediction Depending on the disease: LLaMA-2 can identify and extract medical concepts, entities, and relationships from unstructured text data such as clinical notes, medical records, or patient queries. It can recognize medical conditions, symptoms,

Figure 2 Working of Chatbot

treatments, medications, and other relevant information mentioned in the text. *[7]*

1. Integrating Data Component: - Utilize PDF books as the data component for extracting medical information. *[5]*

2. Data Extraction and Chunking: - Extract content from the PDF books and divide it into smaller chunks, ensuring that each chunk is within the input token limit for the model.

3.Embedding Generation: - Generate embedding's (vectors) for each chunk, representing the semantic meaning of the text.

4.Semantic Index Creation: - Combine the embeddings of all chunks to build a semantic index, representing the collective knowledge from the PDF books. *[1]*

5.Knowledge Base Creation: - Use the semantic index to create a knowledge base, storing the embeddings as a vector database. This serves as a reference for querying relevant information.

6. User Query Processing: - Users input questions or queries into the system, which are then converted into query embeddings, numerical representations suitable for machine learning models.

7.Query to Knowledge Base: - Send the query embedding to the knowledge base, which contains data or vectors relevant to the user's query.

8. Ranking Results: - Retrieve ranked results from the knowledge base based on the similarity between the query embedding and stored data. Results are typically ordered by relevance to the query.

9. Integration of LLaMA-2: - Integrate LLaMA-2, a large language model, into the system to further refine the query and filter results from the knowledge base.

10.Filtering and Refinement: - LLaMA-2 processes the query and filters the ranked results from the knowledge base to identify the most relevant information. This helps refine the results for more accurate responses.

11.Response to User: - Present the filtered and refined results to the user as the system's response to their query. Responses are based on combined processing by the knowledge base and LLaMA-2.

When user ask question to the scheme, logic of the complaint is recognized by applying NLP. Sense of the words is found using part of speech tagging and WordNet dictionary by using this sentiment analysis.

NLP (Natural language Processing) Expanding the functionality of Natural Language Processing (NLP) poses significant challenges, as computers typically require humans to communicate with them in specific programming languages. Human language is inherently

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complex, containing numerous variables. NLP enables users to interact with machines by asking questions. The machine then comprehends the essential elements from the user's speech, which may correspond to specific features in a dataset, and provides a response. The primary goal of NLP is to understand the meaning of text. Stored information includes text files such as patients' medical records, symptoms associated with particular diseases, and medication-related data. The Porter stemming algorithm is employed to standardize words by removing common word endings in English, such as plurals and verb endings. Additionally, it addresses suffixes and transforms certain letters to maintain consistency. Ensuring word order similarity among sentences is crucial, as different arrangements can alter meaning significantly. For instance, swapping the word order in "Dogs can swim, but chickens cannot" changes the meaning entirely. To address this, word order vectors are formed for each sentence, ensuring consistency in meaning representation. This involves comparing words and finding the most similar counterpart in the other sentence, with a predefined threshold to determine similarity. This approach ensures that even though words may vary, the overall meaning is preserved.

want to introduce such noise into our calculation. If we increase the threshold, we could potentially introduce more noise to our calculations, which is not desirable. We repeat the process for both sentences, so we obtain word order vectors for both sentences. The final value for the word order similarity measure is evaluated using the following formula

$$S_r = 1 - \frac{\|r_1 - r_2\|}{\|r_1 + r_2\|}$$

Word order similarity measure among two sentences is calculated as a normalized differentiation of word order. The measure is sensitive to the distance between two words of the word pair. If the distance increases, the measure decreases.

In the Llama-2 model, natural language processing (NLP) works by leveraging advanced algorithms and linguistic techniques to understand and process human language. The model is trained on large datasets of text to learn the patterns, structures, and semantics of language.

NLP in the Llama-2 framework involves various tasks such as:

1. Tokenization: Breaking down text into individual words or tokens.

2. Part-of-speech tagging: Assigning grammatical tags to each word in a sentence.

3. Named entity recognition: Identifying and classifying named entities such as people, organizations, and locations mentioned in the text.

4. Parsing: Analyzing the syntactic structure of sentences to understand relationships between words.

5. Semantic analysis: Extracting the meaning and intent behind the text, including sentiment analysis and topic modeling.

6. Machine translation: Translating text from one language to another.

7. Question answering: Understanding questions posed in natural language and providing accurate responses.

These NLP components enable the Llama-2 model to comprehend and generate human-like responses to user queries, making it well-suited for applications such as chatbots, language translation, and text analysis.

V. RESULT & DISCUSSION

Healthcare chatbots are programs that employ artificial intelligence and natural language processing to simulate conversations with patients. Informative, conversational, and prescriptive chatbots offer immediate response, 24/7 availability, efficient resource management, and enhanced patient satisfaction. Present the results of implementing the healthcare chatbot using the LLaMA-2 framework. Include metrics such as accuracy, relevance of responses, user satisfaction, and system performance.

Obtaining high-quality and diverse datasets containing medical texts for training the LLaMA-2 model can be challenging. Solution: Collaborate with healthcare institutions or organizations to access annotated medical datasets. Augment the dataset with publicly available medical literature and clinical guidelines. Implement data preprocessing techniques to handle noise and inconsistencies in the data.

Generally, the experimental results revealed that chatbots have several advantages (e.g., they provide a real-time response and they improve ease of use)

VI. CONCLUSION

The healthcare chatbot serves as a user-friendly platform for individuals to access medical information and assistance conveniently. By providing a chat-based interface, users can easily input their queries and receive

prompt responses, thereby overcoming barriers to accessing healthcare resources.

This project has made us aware of the immense capabilities and the various technologies uses of Python, LLaMA-2 model, C Transformer, NLP, etc.

The integration of LLaMA-2 has led to more accurate and comprehensive information retrieval from medical texts and knowledge bases. The chatbot can efficiently search and filter through vast amounts of medical data to deliver relevant and up-to-date information to users, facilitating better decision-making and patient care.

We conclude that by automating routine tasks and inquiries, the chatbot helps streamline healthcare workflows and optimize resource utilization. Healthcare professionals can focus their time and attention on more complex and critical cases, thereby enhancing overall efficiency and productivity.

Future directions may include refining the chatbot's semantic analysis capabilities, expanding its knowledge base, incorporating additional features such as personalized recommendations, and evaluating its performance in real-world healthcare settings.

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