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Virtual Patient Simulator For Medical Training

V. Swapna
Department of CSE
Gokaraju Rangaraju Institute of Engineering & Technology, Telangana,India.

E. Sriamsh Reddy
Department of CSE
Gokaraju Rangaraju Institute of Engineering & Technology, Telangana, India.

K. Shivaji
Department of CSE
Gokaraju Rangaraju Institute of Engineering & Technology, Telangana, India.

P. Yashwanth
Department of CSE
Gokaraju Rangaraju Institute of Engineering & Technology, Telangana,India.

P. Praveen kumar
Department of CSE
Gokaraju Rangaraju Institute of Engineering & Technology, Telangana, India.

ABSTRACT:

Virtual Patient Simulator for Medical Training aims to revolutionize medical education through the creation of an innovative chatbot platform. This platform provides medical students with a convenient and immersive training experience. The centerpiece of the system is a chatbot that simulates patient interactions, enabling students to practice diagnosing and treating various diseases. The uniqueness of the platform lies in its userfriendly disease customization feature, allowing students to tailor scenarios. This flexibility ensures relevance to the student's learning needs and diverse medical cases. Furthermore, an integrated feedback mechanism offers an overall rating of the student's performance, highlighting strengths and areas for improvement based on their interactions with the chatbot. To enhance engagement and interactivity, the project incorporates Speech-to-Text capabilities, making the learning process engaging and enjoyable. This project redefines medical training, empowering students with practical skills and insights crucial for their future careers.

1.INTRODUCTION:

Medical education is undergoing a transformative shift, leveraging technological innovations to enhance training methodologies. Hoping to provide an hands-on learning experience, the virtual patient simulator is designed for effective medical training. Central to this paradigm shift is a state-of-the-art chatbot platform that immerses medical students in realistic patient interactions, enabling them to practice diagnosing and treating various diseases. Unlike traditional approaches, the platform's uniqueness lies in its user-friendly disease customization feature, allowing students to tailor scenarios to their learning needs and diverse medical cases. To further elevate the learning experience, the project integrates unique features like Speech-to-Text capabilities, fostering engagement and interactivity. This not only accommodates diverse learning styles but also simulates real-world challenges in patient communication, a critical aspect of healthcare practice.

2. ARCHITECTURE:

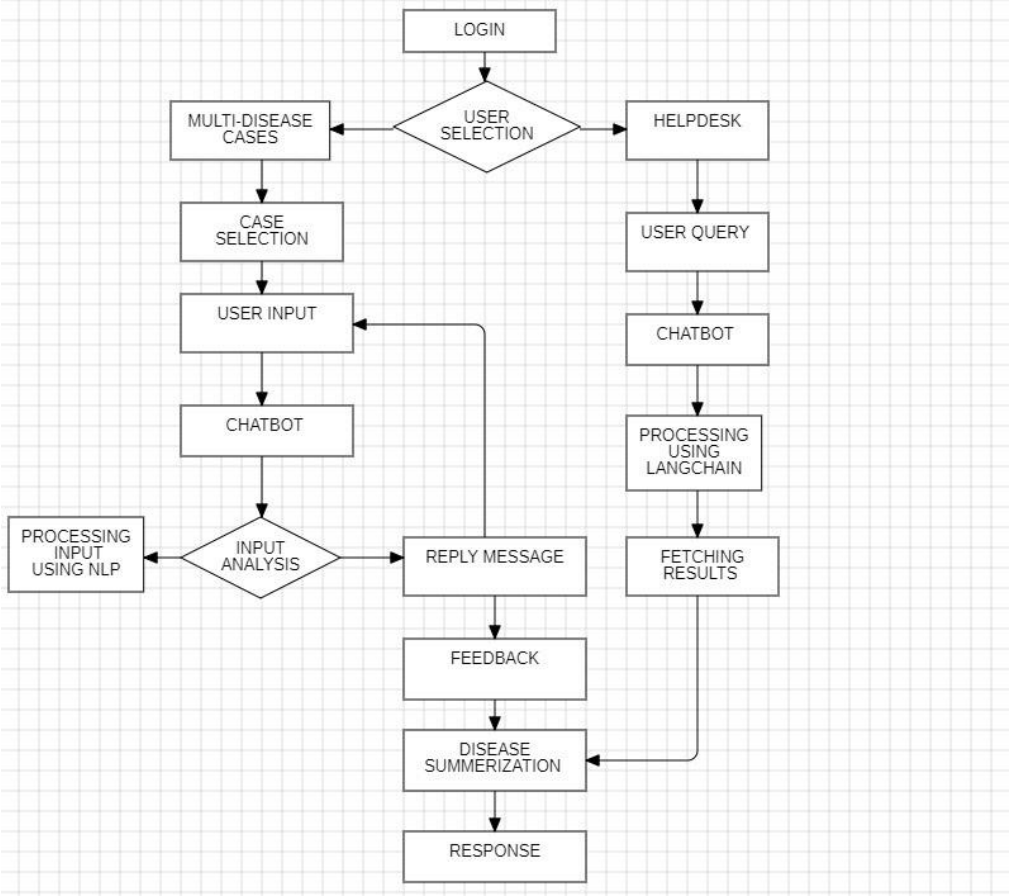

Fig-1. System Architecture

3. Methodology:

3.1. Intent Classification using Bag of Words (BoW):

The methodology employed in the code involves intent classification through a Bag of Words (BoW) approach. This technique converts textual data into numerical feature vectors, representing the presence or absence of words within a document. By tokenizing sentences into words, stemming them, and transforming them into BoW vectors, the code prepares the data for classification. These vectors serve as input to a neural network trained for intent classification.

3.2.Neural Network for Intent Classification:

The code utilizes a feedforward neural network for intent classification. This neural network architecture consists of multiple layers, including an input layer, several hidden layers, and an output layer. By employing fully connected layers and the softmax activation function in the output layer for multi-class classification, the network learns to predict the most probable intent for a given input sentence.

3.3.Stemming:

Stemming is a crucial preprocessing step used to reduce words to their root or base form. In the code, the Lancaster Stemmer algorithm is applied for stemming purposes. By reducing words to their base forms, stemming helps streamline the vocabulary and improve the efficiency of text processing and classification tasks.

3.4.Training and Testing Data Split:

To evaluate the model's performance, the code partitions the data into training and testing sets. This process involves random shuffling and partitioning of the dataset. By splitting the shuffled data into distinct training and testing subsets, the model's ability to generalize to unseen data can be assessed effectively.

3.5.Threshold-based Classification:

The classification of intents in the code is based on a predefined threshold. After predicting intent probabilities, only those exceeding a certain confidence threshold are considered valid. This threshold-based approach ensures that only confident predictions are utilized for classification, thereby improving the accuracy of the classification process.

3.6.Response Generation:

The code generates responses based on classified intents. This involves randomly selecting responses associated with the predicted intent from a predefined set of responses. By providing a conversational interface, the chatbot can engage users effectively by offering contextually relevant replies.

3.7.Dynamic Prompt Generation:

Dynamic prompts are generated in the code to guide the agent in responding to user queries effectively. This is achieved through string formatting based on template strings and available tools. The dynamically generated prompts include information such as input questions, intermediate steps, available tools, and the agent's scratchpad, enhancing the agent's ability to provide informative and contextually appropriate responses.

3.8.Memory for Conversation Context:

To maintain context during conversations, the code implements a memory mechanism that stores previous conversation history. This memory, based on a conversation buffer window, enables the chatbot to retain context from recent interactions and provide more coherent and contextually aware responses. By leveraging the conversation history, the chatbot can enhance the continuity and quality of the conversation experience for users.

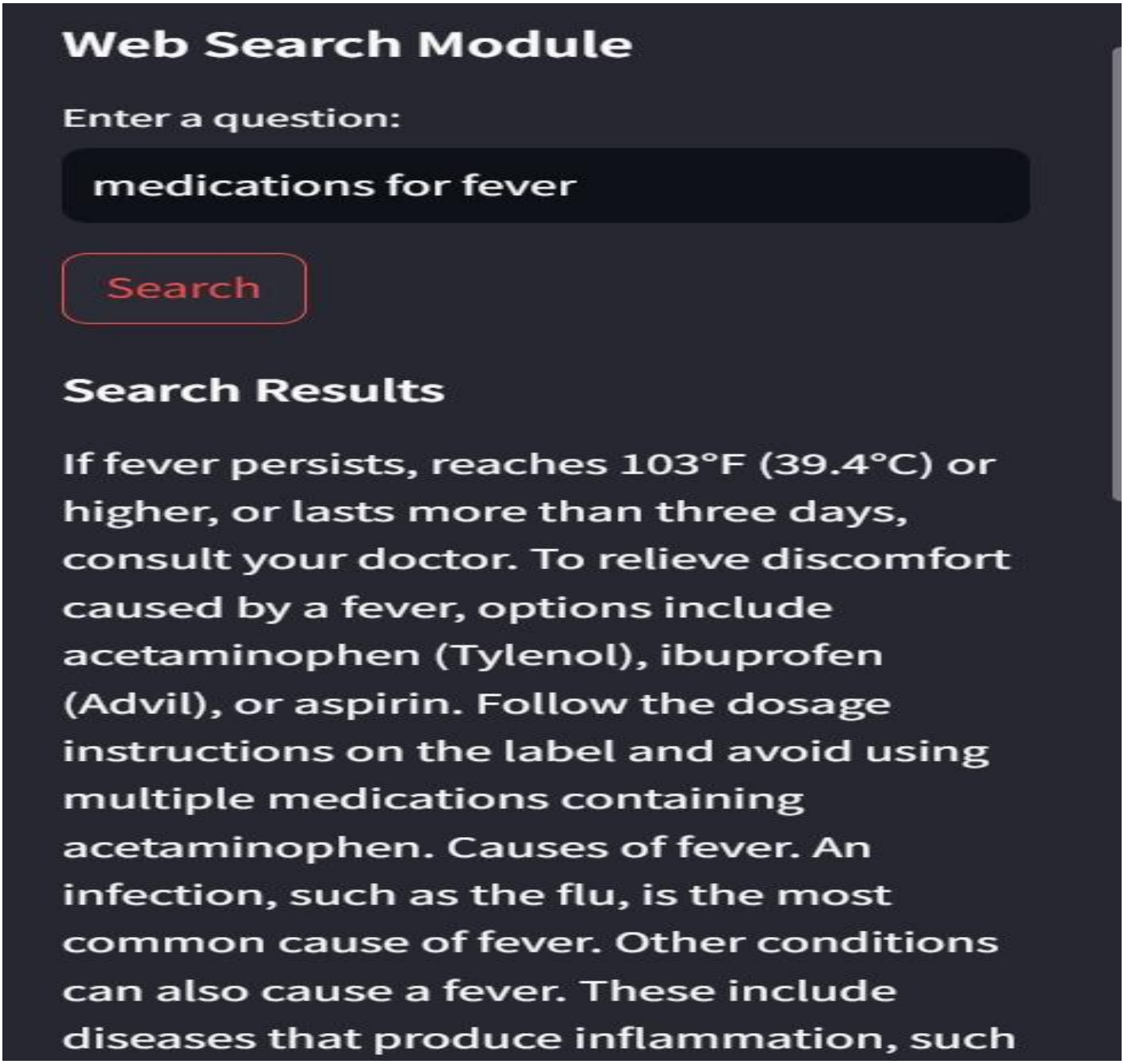

Fig-2. Help Desk

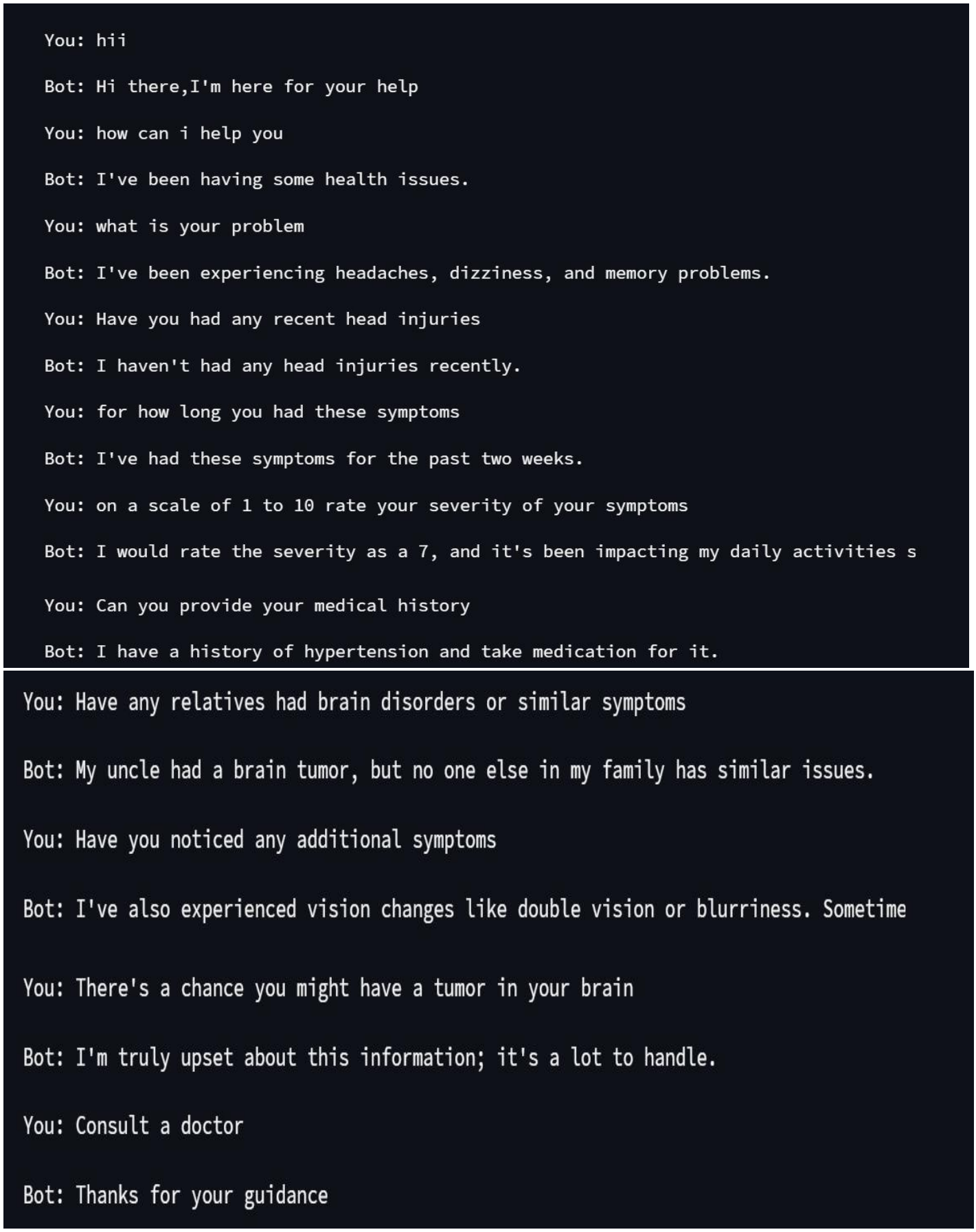

Fig-3. Communication between virtual patient and user

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