RESEARCH ARTICLE OPEN ACCESS

Health Care Chat Bot By using NLP, Decision Tree and SVM

Mr U. Bhargav Kumar [1], Smt M. Prashanthi [2], Smt D. Madhuri [3]

[1] PG Scholar, Department of CSE, JNTUA College of Engineering Anantapur.

[2] Assistant Professor (Contract), Department of CSE, JNTUA College of Engineering Anantapur.

[3] Assistant Professor (Contract), Department of CSE, JNTUA College of Engineering Anantapur.

ABSTRACT

Healthcare chatbots are designed to provide medical information, answer health-related questions, and offer support to patients and healthcare professionals through text-based conversations, enhancing accessibility and efficiency in healthcare services. The increasing population and birth rates in India and reduced death rates due to medical advancements have created a severe shortage of doctors, resulting in inadequate treatment and patient fatalities. To address these challenges, the development of an intelligent chatbot that offers guidance to doctors and patients is crucial, potentially saving lives. Chatbots, versatile virtual assistants, can identify symptoms, offer diagnoses, and recommend suitable doctors, making them a valuable addition to Healthcare services. The existing system for a Healthcare chatbot incorporates rule-based and keyword matching, While rule-based and keyword-matching algorithms offer efficiency and consistency in Healthcare chatbots, it's important to note that they may have limitations in handling complex or context-dependent queries The proposed system for a Healthcare chatbot integrates Natural Language Processing (NLP) techniques, Decision Trees, and Support Vector Machines (SVM) to create an advanced and intelligent Healthcare chatbot solution.

Keywords - Chatbot, Natural Language Processing (NLP) techniques, Decision Trees, and Support Vector Machines (SVM).

I. INTRODUCTION

Health professionals face resource constraints and cannot provide constant personal monitoring and assistance to patients in their daily routines [1]. To improve healthcare technology electronic patient records, and medical devices, it is crucial to minimize errors, especially those that go unnoticed, as clinicians cannot effectively mitigate the harm caused by such unnoticed errors [2]. In the context of healthcare, machine learning techniques are harnessed to leverage the abundant health data generated by IoT. This introduction sets the stage for our exploration of machine learning applications in medical imaging, natural language processing of medical documents, and genetic information. We focused on how machine learning is transforming healthcare by aiding in diagnosis, detection, and prediction. We also address challenges in data utilization, providing insights into the current state of machine learning in healthcare.[3]

learning, transforming the healthcare industry. Its primary objective was to provide cost-effective and enhanced healthcare services to patients, concurrently revolutionizing the healthcare business model. Within this context, this paper not only categorized potential healthcare applications but also introduced a service-oriented middleware framework designed to facilitate application development within this paradigm.[4]

Healthcare systems have evolved into a market for companies developing chatbot-based computer programs for patients and doctors [5]. Healthcare systems that actively engage with aged people/patients to gather information, monitor health conditions, and provide support, especially in case of post-hospital situations or in the home environment.

In the healthcare sector, the adoption of medical chatbots is on the rise, primarily due to the expanding population in India and the shortage of available doctors to cater to this rapidly growing populace. Even healthcare professionals can make diagnostic errors, posing risks to patients' lives, as illustrated by the case of Mohammed Benaziza, a renowned bodybuilder in the 1990s, who tragically died due to a misdiagnosis of Hypokalaemia.

To address such issues, medical chatbots play a crucial role by providing guidance to healthcare

professionals in critical situations and offering initial treatment advice to the general public during emergencies. The chatbot can also assess specific ailments through a series of questions and provide information on recommended precautions and remedies.

Additionally, medical chatbots contribute to the efficiency of the Healthcare system by streamlining administrative tasks like appointment scheduling and medical record management. This efficiency allows Healthcare providers more time to focus on patient care. Furthermore, as technology continues to advance, medical chatbots are poised to expand their capabilities, potentially revolutionizing the way Healthcare is delivered and accessed, benefiting both patients and Healthcare providers.

II. LITERATURE REVIEW

In the paper [1] author explained the faced by health professionals who often lack the resources to personally monitor and support patients in their daily lives. They investigate the potential of text-based healthcare chatbots (THCB) to address these challenges, particularly in therapeutic settings beyond traditional on-site consultations. The paper also introduces an open-source THCB system and its application in a childhood obesity intervention, showcasing preliminary results indicating promising intervention adherence and scalability, along with high patient satisfaction. [1]

Harold Thimble [2] highlights the imperative need to improve healthcare technologies, including electronic patient records and medical devices, by reducing use errors and unnoticed errors that may lead to patient harm. The authors emphasize the importance of implementing safety scoring systems to enhance design safety and inform all stakeholders, including regulators, clinicians, and patients, to put pressure on manufacturers for safer designs. [2]

In [5] the author highlights the growing role of chatbots in Health Care, describing their potential to interact energetically with patients, especially in post-hospital or home environments. These chatbots bridge the gap between patients and Healthcare providers, aided by AI and machine learning. The proposed system aims to assist patients in disease identification, acting as both a diagnostic tool and a sleep coach, thus contributing to cost savings and user-friendliness in Health Care. [5]

Jahnvi Gupta, Vinay Singh, and Ish Kumara[6] address the common reliance on hospitals for Healthcare analysis, diagnosis, and prescriptions. It introduces a novel approach utilizing the RASA framework to build a chatbot capable of diagnosing diseases based on user symptoms. Their system aims to provide quick and hassle-free answers to health-related queries while also recording users' daily nutrient intake, offering a potentially transformative alternative to traditional Healthcare practices.

In the paper [7] the author explores the evolution of eHealth, driven by technological advancements such as smartphones and electronic wearable devices. It introduces the concept of mHealth and its role in aiding healthcare through smartphones and IoT devices. Additionally, the paper discusses the increasing importance of information technology in healthcare, leading to the emergence of telemedicine, which facilitates remote communication between patients and doctors via multimedia. The paper also highlights existing telemedicine applications and proposes a comprehensive approach to eHealth.

Ming-Chin Yang, Chin-Yuan Huang, and Chin-Yu Huang [8] address the global rise in obesity, emphasizing the role of mobile applications in public health interventions. It introduces the "Smart Wireless Interactive Healthcare System" (Switches) as a solution for objective data collection and transmission in real-time. Switches leverage AI-powered health chatbots to engage users and provide accurate medical advice, presenting an overview of their development and implementation.

In the paper [9] the author underscores the importance of Healthcare accessibility and the potential of AI-driven medical chatbots to reduce costs and improve medical knowledge availability. It introduces medical chatbots as versatile tools, serving as medical reference books and offering personalized advice for a healthier life. The paper emphasizes the benefits of text-to-text diagnosis bots in engaging patients and providing personalized diagnoses based on symptoms.

Nishargo Nigar and Mohammed Nazim Uddin[10] highlight the critical role of proper observation in children's Health Care, particularly in addressing concerns like childhood obesity and malnutrition. It introduces the concept of IoT-enabled smart nutrition cards, tracking various aspects of a child's health and activity. These cards leverage smartphone sensors, AI, and recommendation methods, with potential applications in urgent hospitalization and disease management.

In the paper [11] the author Ahmed Fadhil focuses on addressing the rising burden of chronic noncommunicable diseases by introducing CoachAI, a conversational agent-assisted health coaching system. It presents an approach to develop the chatbot dialogue and coaching platform, aiming to support physicians in managing patient care and reducing their workload. The paper also discusses patient profiling and physical activity recommendations, contributing to preventive Health Care. [11]

III. EXISTING MODEL

In the past, previous systems predominantly relied on either rule-based methodologies or keyword-matching algorithms, both of which had limited capabilities in comprehending natural language queries.

Keyword matching, a straightforward algorithm, involves searching for specific words or phrases within a text and then executing actions or responses based on predefined keywords or phrases. This approach found common usage in tasks such as content filtering, topic identification, or sentiment analysis.

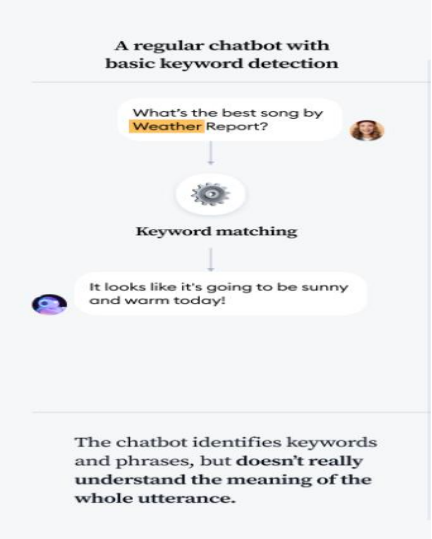

Fig [1] Working of the keyword matching algorithm

Fig [2] Matching case of the keyword and function

In contrast, the rule-based approach operated by making decisions or taking actions according to predefined rules or conditions, often drawing on human expertise or domain knowledge. This method assessed input data against the established rules, implementing actions or decisions accordingly. It could be more intricate than simple keyword matching and typically incorporated logical operators, conditions, and multiple interacting rules, finding applications in expert systems, decision support systems, and chatbots. Furthermore, the system allowed for multiple authorizations to access the chatbot, enhancing its adaptability and user-friendliness.

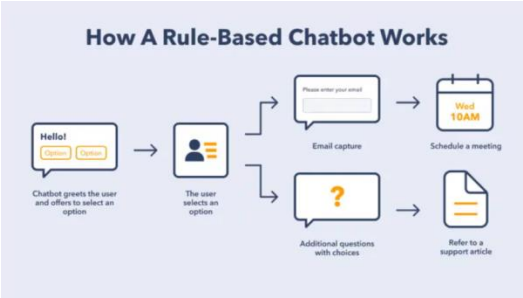

Fig [3] working of the rule-based algorithm

Limitations:

• Complex user interface. Making users difficult to recognize the operations

• Late response to user due to highly dumped data set

• More processing time to process huge data

IV. PROPOSED MODEL

In the proposed Healthcare chatbot system, a combination of Natural Language Processing (NLP) techniques, Decision Trees, and Support Vector Machines (SVM) is employed to create an advanced and intelligent Healthcare chatbot solution.

Natural Language Processing (NLP): NLP is a field encompassing linguistics, computer science, and artificial intelligence. It focuses on teaching computers to understand and analyze human language, enabling them to extract information and insights from text documents and facilitate human-like conversations. Chatbots, as a form of NLP software, simulate conversations with users through natural language, making them a significant advancement in human-machine interaction.

Text Pre-processing: Text pre-processing is a crucial step in NLP, involving tasks like tokenization, lowercasing, removing stop words, stemming, and handling punctuation and special characters. It prepares raw textual data for advanced NLP tasks such as sentiment analysis and topic modeling.

Named Entity Recognition (NER): NER is an NLP technique that identifies and classifies named entities in text, including names of people, organizations, locations, dates, and more. It is essential for applications like information extraction and improving search engines' understanding of user queries.

Intent Recognition: Intent recognition is vital in conversational AI systems like chatbots, as it helps determine the user's purpose behind their input. Machine learning algorithms, including neural networks, are often used to classify user input into predefined categories or intents, allowing chatbots to offer relevant responses.

Fig[4] Working of the NLP chatbot

Support Vector Machines (SVM): SVMs are used in Healthcare chatbots for classification tasks. They involve data collection, feature extraction, data splitting, model training, hyperparameter tuning, prediction, and response generation. SVMs find decision boundaries to separate different intent classes, making them suitable for tasks like appointment scheduling or symptom analysis.

Decision Trees: Decision trees are employed for tasks like symptom analysis, where chatbots need to make decisions based on a series of conditions. They involve data collection, feature selection, model building, defining stopping criteria, training, prediction, and response generation. Decision trees are useful for providing medical advice or recommending further actions based on patient symptoms.

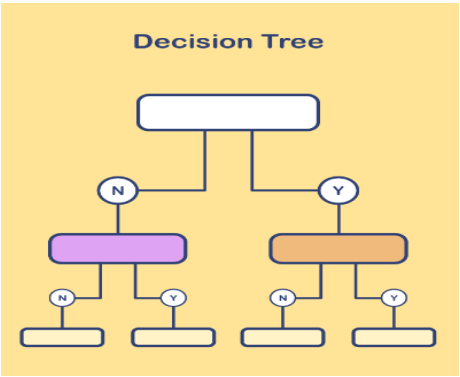

Fig [5] Decision Tree algorithm working

Advantages:

- more visually pleasing

- Less response time to user
- Less processing time

V. EXPERIMENTAL RESULTS

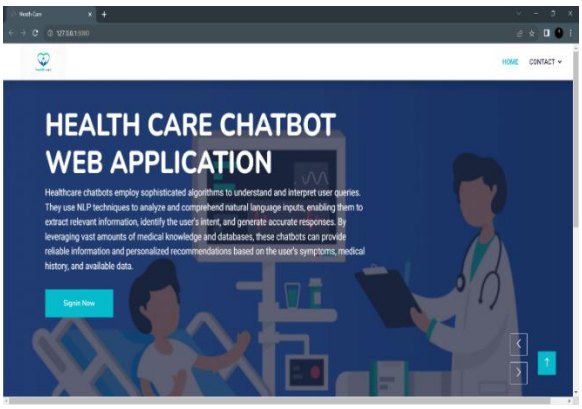

Fig [6] Home page 1

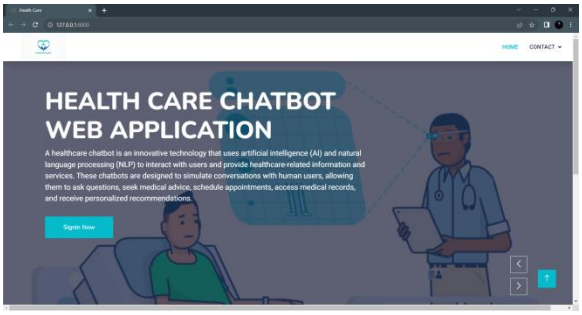

Fig [7] Home page 2

The above Fig [6] and Fig [7] refer to the home page features a user-friendly interface with options to sign up, access our AI-powered chatbot for inquiries, and connect with our support team via the contact section

Registration Page:

Fig [8] Registration page

The above Fig [8] refers registration page is designed to collect essential information for your account setup. It includes fields for your first name, last name, email address, password, phone number, and address to ensure a seamless and secure user experience

Login Page:

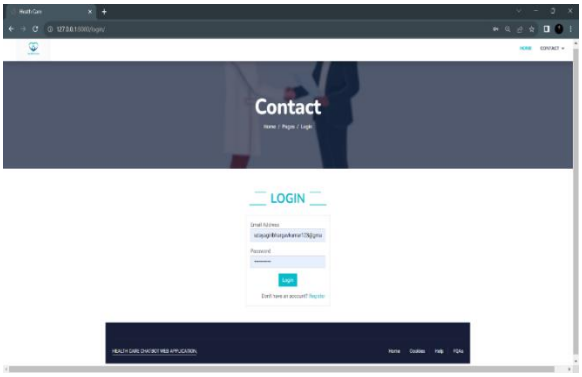

Fig [9] Login page

The above Fig [9] refers login page that offers convenient access to your account with just your email address and password. If you're new, simply click "Register." Need assistance? Explore our "Help" section for support, check out our "FAQs" for common questions, or return to the "Home" page for updates and information

Take Query:

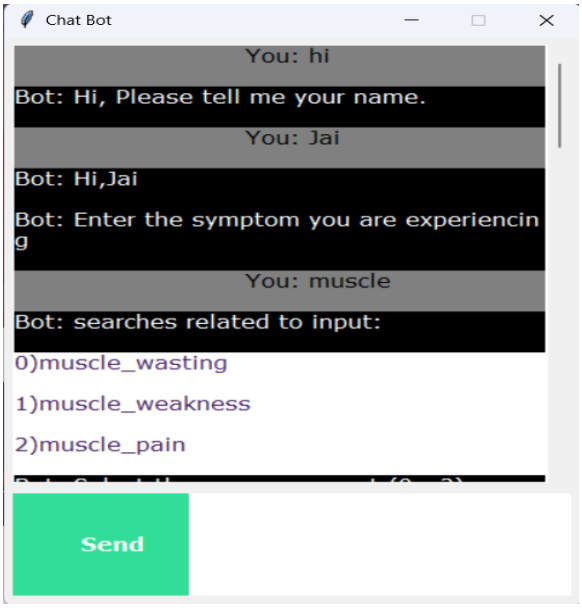

Fig [10] Query page

The above Fig [10] refers to the "Take Query" page functions like a chatbot for health-related queries. It allows users to input their health symptoms or concerns, offering a conversational and user-friendly way to seek information and guidance regarding their well-being.

Provide Results:

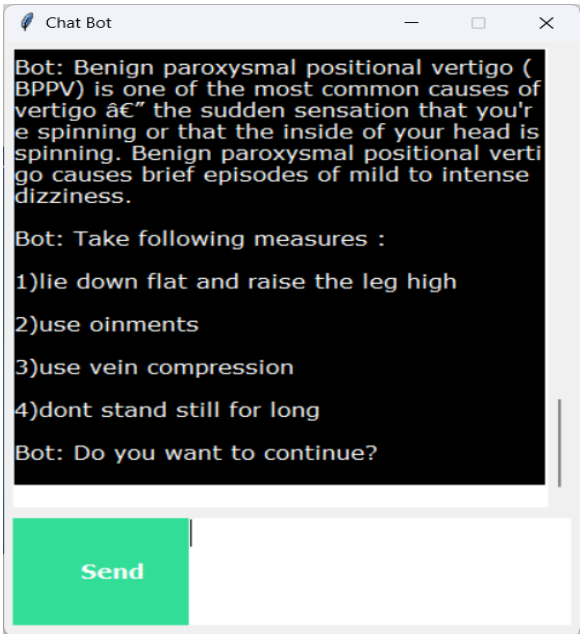

Fig [11] Results page

The above Fig [11] refers to the "Provide Result" page operates as an interactive health chatbot. Users can input their health symptoms or concerns, and the chatbot will provide valuable information along with recommended precautions, offering personalized guidance for maintaining well-being.

VI. CONCLUSION AND FUTURE SCOPE

Chatbots are an emerging technology with significant potential for the future, gaining popularity in various industries. Their impact is expected to be long-lasting, making it exciting to witness the advancements in this field as they overcome previous limitations. The development of this system is a response to the growing population in our country. While such systems are already in use in other countries, they are not widely accessible here. The shortage of doctors, especially in government hospitals in our city, is a well-recognized issue. Introducing a medical chatbot aims to address this gap by offering medical assistance when doctors are unavailable, thereby improving the efficiency of the healthcare industry and potentially reducing mortality rates.

Looking ahead, user-friendly Healthcare chatbots have a promising future. They can facilitate efficient doctor consultations, streamline appointment booking processes, and provide map support for locating medical facilities. This makes healthcare more convenient and accessible to users.

REFERENCES

[1] Tobias Kowatsch, "Text-based HealthcareChatbots Supporting Patient and Health", ,https://doi.org/10.3929/ethz-b-000218776, 01 October 2017.

[2] Harold Thimbleby, "Improving safety in medical devices and systems" , College of Science University of Swansea, http://dx.doi.org/10.5772/intechopen.92297, Wales 2013.

[3]James P. Brody, Christoper Toh, "Applications of Machine Learning in Health Care," University of California, Irvine, http://dx.doi.org/10.5772/intechopen.92297, January 2021.

[4] JAMEELA AL-JAROODI, Nader Mohamed, , EMAN ABUKHOUSA", Health 4.0: On the Way to Realizing the Healthcareof the Future," Modul University Dubai, Dubai, United Arab Emirates, https://doi.org/10.1109%2FACCESS.2020.3038858, October 2020.

[5] B. Priyadarshini, P. Ponmurugan, , P. Preetha, V. Preethikadevi, “Healthcare Assisting Chat bot for symptoms and dosage prediction using IoT", Sri Krishna College of Technology, Coimbatore, Tamilnadu, India, 2018.

[6] Jahnvi Gupta, Vinay Singh, Ish Kumar, "Florence- A Healthcare Chat bot," Galgotias College of Engineering & Technology, Greater Noida, INDIA, https://doi.org/10.1109/ICACCS51430.2021.9442006 , 2021.

[7] Adwitiya Mukhopadhyay, Sreenadh M, Anoop A, "eHealth Applications: A Comprehensive Approach," Mysuru Amrita Vishwa Vidyapeetham, India, https://doi.org/10.1109/ic-ETITE47903.2020.165, 2020.

[8] Chin-Yuan Huang, Ming-Chin Yang, Chin-Yu Huang, "A Chatbot-supported Smart Wireless Interactive Healthcare System for Weight Control and Health Promotion," Proceeding of the IEEE, http://dx.doi.org/10.1109/IEEM.2018.8607399, April 2018.

[9] Ishwarya, A. Divya, Indumathi, Priyasankari, "A Self Diagnosis Medical Chat bot Using Artificial Intelligence," proceeding MAT Journal, October 2017.

[10] Nishargo Nigar, Mohammed Nazim Uddin "An Internet of Things Enabled Intelligent System and Smart Nutrition Card to Enhance Children's Health Consciousness," East Delta University Chittagong, Bangladesh, June 2018.

[11] Ahmed Fadhil, "Text-based Chatbot Assisted Health Coaching System: Preliminary Evaluation & Results," University of Trento, Trento http://dx.doi.org/10.13140/RG.2.2.22231.32164, May 2019.