

Counselling Therapy Chatbot using Artificial Intelligence

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Abstract—

The project endeavors to address the escalating mental health challenges, particularly concerning Attention Deficit Hyperactivity Disorder (ADHD), by offering an AI-driven conversational interface for support. ADHD has increasingly become a prevalent concern in modern times, affecting individuals across various age groups. Leveraging Natural Language Processing (NLP) techniques, the chatbot analyzes user input to gauge emotional sentiment, detect keywords related to mental health concerning ADHD. It then offers tailored responses based on sentiment analysis, providing empathetic and informative guidance to users. The backend, built with Flask, employs sentiment analysis, clustering, and keyword detection to understand and categorize user queries. The frontend, designed using React, facilitates a chat interface enabling users to interact with the chatbot seamlessly. The chatbot's adaptive nature allows it to dynamically respond to various emotional states and mental health-related inquiries, providing personalized support and suggestions. The chatbot strives to bridge the gap in mental health support and offer personalized assistance to individuals dealing with ADHD symptoms with the help of natural language processing.

Keywords— Natural Language Processing, Sentiment Analysis, Emotional Analysis, Text Classification, Clustering, Chatbot, Mental Health, Attention Deficit, Hyperactivity Disorder, Coping Strategies.

I. INTRODUCTION

In an era marked by a growing awareness of mental health challenges, Attention Deficit Hyperactivity Disorder (ADHD) stands as a prevalent concern affecting diverse age groups. This project amalgamates cutting-edge Natural Language Processing (NLP) techniques with advanced sentiment analysis, clustering, and keyword detection algorithms. Through Python-based Flask backend and React frontend, this initiative fosters an intuitive and responsive conversational interface. The chatbot, an epitome of sophistication, harnesses the power of NLP to comprehend user sentiments, identify subtle cues related to ADHD, and dynamically tailor responses to offer empathetic support.

The Flask backend intricately leverages sentiment analysis to decipher emotional states, complemented by clustering methods for query categorization. Additionally, keyword detection algorithms adeptly recognize ADHD-associated terms, ensuring prompt and relevant interventions. React on the frontend enriches user experience, providing a fluid chat interface enabling seamless interaction with the chatbot. By adapting to varying emotional states and mental health queries, this chatbot aspires to extend personalized and empathetic assistance, bridging the gap in mental health support. Through this convergence of technology and empathy, it aims to offer a comforting space for individuals encountering challenges associated with ADHD symptoms.

II. LITERATURE SURVEY

AI driven [1] chatbots offering counselling and support aim to provide immediate assistance to those facing mental health challenges through conversational interfaces. However, this advancement brings ethical and privacy concerns regarding sensitive mental health data

handling. Maintaining confidentiality while deploying machine learning for personalized interventions remains challenging. Additionally, the complexity of human emotions poses a hurdle for accurate AI-driven interventions. Challenges include biases in algorithms [2], insufficient data representation, and interpretability of AI-generated recommendations. The overview highlights machine learning's potential in bolstering mental health support but stresses the need for robust ethical frameworks, data security, and ongoing algorithm refinement. Addressing these challenges is crucial to ensure responsible and effective use of machine learning technologies in mental health settings.

The landscape of chatbots and conversational agents in mental health, emphasizing their potential benefits and inherent limitations. [3] These technologies promise accessible mental health support, acting as round-the-clock guides offering personalized assistance and a safe space for expression. The benefits include enhanced accessibility, reduced stigma, and the potential to aid a broader population by delivering evidence-based interventions and timely support. However, the concerns about the impersonal nature of these interactions, questioning their ability to replicate the depth of human empathy [4]. Moreover, accuracy in diagnosis, data privacy, and the risk of feelings of isolation are significant concerns.

NLP techniques like tokenization, semantic analysis, and tailored machine learning algorithms for sentiment analysis, are pivotal in parsing text for emotions and context during counselling interactions. [5] However, capturing intricate emotions and assessing mental states solely through text poses challenges in the sensitive domain of mental health. [6] Human emotions carry complexities that automated systems might struggle to interpret accurately. The study

likely highlights limitations in current sentiment analysis models, acknowledging their difficulty in comprehending the depth of human emotions and mental health nuances. Sharma's investigation emphasizes the importance of ongoing NLP advancements in counselling. It underscores the need for nuanced approaches, combining automated analysis with human judgment, to ensure more accurate assessments of individuals' mental states during counselling, recognizing the invaluable role of human context in this delicate process.

The chatbots exhibit promise by providing accessible interventions, delivering therapies, and offering immediate aid to individuals experiencing symptoms.[7] Yet, limitations arise in their ability to grasp complex human emotions and ethical concerns around privacy and data security. While they offer convenience, the depth of understanding needed for depression care remains a challenge. Bunge's evaluation highlights the need to view AI chatbots as complementary tools rather than standalone solutions in depression management. It emphasizes ongoing research, ethical guidelines, and a balanced approach merging AI's strengths with human insight to ensure comprehensive mental health support. The overview gives us an idea of how AI can be used to help with Depression.[8]

Research provides a comprehensive understanding ADHD from childhood through adulthood.[9] ADHD, a prevalent neurobehavioral disorder, often persists into adulthood, accompanied by symptoms and impairment. Co-occurring conditions like disruptive mood, anxiety disorders, and substance abuse are commonly associated with ADHD. Diagnosis relies on symptom review and functional impairment assessment, supported by genetic, neuroimaging, and neuropsychological data. Multimodal treatment incorporates educational, family, and individual support, with psychotherapy and medication, including stimulants, noradrenergic agents, alpha agonists, and antidepressants. Pharmacotherapy plays a pivotal role in long-term management, ensuring comprehensive care for ADHD throughout an individual even in adulthood [10].

Here are some of the existing conversational AI chatbots that help users with understanding their emotions or just talk to them as a friend.

1. **Cleverbot** [11] is an AI chatbot designed for casual conversation. It uses machine learning algorithms to engage in dynamic and context-aware discussions with users. Cleverbot's responses are generated based on patterns learned from millions of conversations.

2. **Replika** [12] is an AI chatbot designed to act as a conversational partner and provide emotional support. Users engage in conversations with Replika, and over time, it learns from these interactions to develop a personalized and empathetic conversational style.

3. **Woebot** [13] is an AI-powered chatbot designed to provide mental health support. It uses principles of cognitive-behavioral therapy (CBT) to engage users in conversations, offer coping strategies, and provide emotional support for issues like anxiety and depression.

III. PROPOSED SYSTEM

The project we developed is an innovative AI-driven conversational interface aimed at addressing the growing mental health concerns, particularly focusing on Attention Deficit Hyperactivity Disorder (ADHD). Leveraging cutting-edge Natural Language Processing (NLP) techniques, this chatbot serves as a supportive platform, analyzing user input to comprehend emotional sentiments and detect keywords related to ADHD and mental health.

Utilizing Flask as the backend and React for the frontend, the system uses NLTK(Natural Language toolkit), libraries, keyword detection algorithms for sentiment analysis, clustering, and to understand and categorize user queries. The chat interface allows seamless interaction with the chatbot, offering personalized guidance and suggestions. The project's core goal is to offer a dynamic, adaptable, and empathetic support system for individuals experiencing ADHD symptoms or seeking mental health assistance even in their adulthood. By combining advanced NLP and a user-centric interface, the project aims to enhance mental health support accessibility and provide tailored assistance for those dealing with ADHD-related challenges.

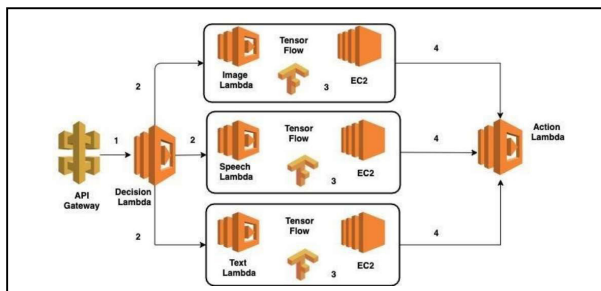


Figure 1: TensorFlow based Chatbot Diagram

While TensorFlow, which was used in other chatbots provided a solid foundation, the shift to NLP was motivated by the desire for a more tailored and efficient approach to handle the intricacies of language understanding in counseling scenarios. NLP techniques offered a nuanced and targeted solution, allowing us to better capture and interpret the nuances of users' emotional expressions and refine the counseling chatbot's capabilities. The proposed system focuses on providing apt responses to the user after identifying their symptoms with suitable advice that helps them deal with their current emotions.

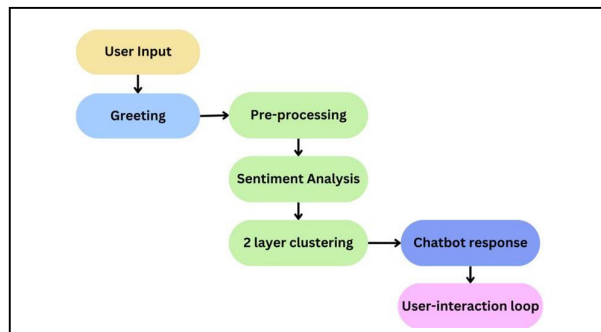


Figure 2: Process Flow of the Chatbot

IV. RESULTS

The results of the ADHD Counselling Chatbot project showcase its efficacy in providing meaningful support and guidance to users dealing with ADHD-related challenges. Through the integration of advanced natural language processing (NLP) techniques, the chatbot adeptly analyzes user input, gauges emotional sentiment, and accurately clusters queries. This not only enables the system to identify key keywords associated with ADHD symptoms but also allows it to deliver personalized advice and recommendations based on the user's emotional state. The chatbot's adaptive nature, coupled with its proficiency in addressing diverse emotional states, positions it as a versatile tool for users seeking assistance in managing ADHD symptoms.

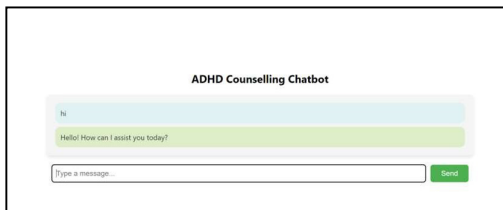


Figure 3: Homepage with chat interface

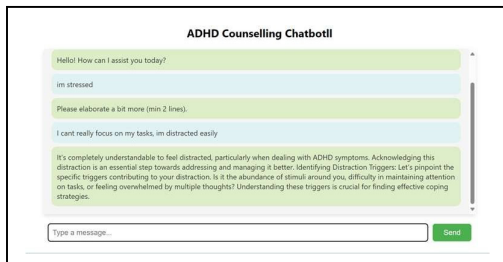


Figure 4: Chatbot's response to the user

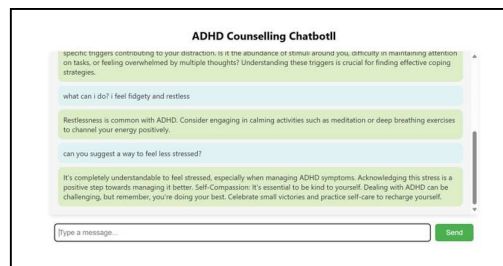


Figure 5: Chatbot advising the user to try activities

Users experience a seamless interaction with the chatbot, which dynamically responds to varying emotional nuances. The incorporation of open-source NLP libraries not only ensures cost-effectiveness but also contributes to the project's sustainability and scalability.

V. CONCLUSION

Counselling Therapy Chatbot using Artificial Intelligence works as intended. It takes the input from the user in the form of text, then, input goes under Natural Language Processing, Sentiment Analysis, Cluster Analysis and gives the user appropriate suggestions based on the ADHD keywords found in the input to help the user feel better and also encourages them to try an activity that will help with improving their mood.

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