International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 10 | Oct - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

Review Paper on "Jarvie: AI-Driven Mental Health Companion"

Mrs. Mayuri Fegade[1], Pratik Bandpatte[2], Neha Medar[2], Devesh Mahajan[2], Vishal Wagh[2]

[1]Assistant Professor, [2]B.E. Student

Department of Artificial Intelligence & Data Science, DYPCOEI, Varale, Pune, Maharashtra, India

---

Abstract - With the growing prevalence of mental health issues, many individuals still face barriers to accessing timely and effective support. This paper presents an innovative AI-powered Mental Health Companion aimed at providing personalized, real-time mental health assistance. By utilizing advanced natural language processing (NLP) techniques and machine learning models, the system interacts with users through meaningful conversations, offering customized coping strategies, mood tracking, and resource recommendations. The solution incorporates techniques such as sentiment analysis and adaptive learning to continuously refine responses based on user behavior and emotional states. The companion's effectiveness will be measured through metrics including user engagement, response accuracy, and its impact on emotional well-being. This scalable, on-demand tool offers the potential to significantly expand access to mental health support, reducing the strain on traditional services.

Keywords - **Artificial Intelligence, Mental Health, Natural Language Processing (NLP), Machine Learning, Chatbot, Mental Health Companion, Sentiment Analysis, Conversational AI, Generative AI.**

I.INTRODUCTION

In an age where mental health issues affect millions of people worldwide, there remains a significant gap in access to timely and effective support. Barriers such as stigma, limited availability of professional help, and cost constraints often prevent individuals from seeking the mental health care they need. To address these challenges, the "Jarvie: AI-Driven Mental Health Companion" project introduces an AI-powered virtual assistant designed to offer accessible and personalized emotional support. Leveraging cutting-edge Natural Language Processing (NLP) and Generative AI, the companion engages users in real-time, empathetic conversations, providing coping strategies, mood monitoring, and actionable insights based on dynamic sentiment analysis. By continuously learning from user interactions, the system adapts to individual needs, ensuring a tailored approach to mental well-being. This innovative solution has the potential to reduce the strain on traditional mental health services, promote mental wellness, and offer scalable support to underserved populations.

II. LITERATURE SURVEY

The research paper presents Sakhi, an AI-generated mental health companion aimed at providing emotional support to users. It highlights the increasing prevalence of mental health issues globally and the necessity for accessible support systems. The authors describe how Sakhi employs advanced natural language processing (NLP) techniques to facilitate meaningful conversations and deliver personalized advice. Feedback from users indicated significant improvements in emotional well-being, demonstrating Sakhi's potential as an effective tool for mental health intervention, particularly in underserved populations [1].

The paper introduces MOODIFY, a personalized AI assistant designed specifically for young adults grappling with mental health issues. The research emphasizes MOODIFY's unique ability to adapt its interactions based on individual user data, thereby providing tailored support. Through sentiment analysis and adaptive learning algorithms, the assistant helps users identify and manage their mental health challenges. The results of user evaluations suggest that MOODIFY significantly enhances engagement and offers practical coping

strategies for young adults, highlighting its importance in mental health support [4].

This research introduces EMPATH.AI, a context-aware chatbot focused on emotional detection and responsive support. The authors discuss the critical role of contextual understanding in emotional interactions, showing how EMPATH.AI leverages user data to accurately assess emotional states. The study's findings demonstrate that the chatbot effectively engages users, fostering improved emotional awareness and coping mechanisms. User assessments indicated a marked increase in satisfaction and emotional resilience, underscoring the chatbot's value as a supportive tool for mental health [3].

The authors of this paper explore the design and implementation of a chatbot aimed at promoting mental well-being through conversational engagement. They discuss how the chatbot incorporates principles of psychology, such as positive reinforcement and cognitive-behavioral strategies, to support users effectively. The study evaluates the chatbot's impact on users' mood and anxiety levels, revealing that regular interactions significantly improve mental health outcomes. The research underscores the potential of chatbots as accessible mental health resources, offering users a valuable alternative for support [7].

The research presents KrishnaVani, an AI-powered companion tailored to support the mental health of students. The authors address the unique stressors faced by students, including academic pressures and social anxiety, and explain how KrishnaVani offers targeted support and resources. By utilizing cognitive-behavioral therapy techniques and mindfulness strategies, the chatbot fosters resilience and coping skills among students. User feedback indicates that KrishnaVani enhances students' mental health management, demonstrating the significant role of AI-driven interventions in educational settings [2].

III.PROBLEM DEFINITION

Despite increasing awareness of mental health issues, many people encounter barriers to accessing timely and personalized support due to limitations in traditional services. This project aims to address these challenges by developing an AI-powered mental health companion that uses advanced natural language processing to offer real-time and empathetic support, thereby improving access to mental health support and enhancing overall well-being.

IV. PROPOSED METHODOLOGY

The development of the AI-driven mental health companion follows a systematic and structured approach, divided into several key stages to ensure robust functionality and user experience. These stages encompass data integration, model deployment, feature extraction, and user interaction, with an emphasis on scalability and real-time responses.

1. Data Collection and Preprocessing

Data Acquisition: The project will leverage pre-trained models and integrate external APIs such as OpenAI or Hugging Face for generating conversational responses. These APIs provide access to vast datasets and models fine-tuned for language processing, enabling the chatbot to respond empathetically and contextually.

Sentiment Analysis: To improve emotional detection and appropriate response generation, sentiment analysis APIs will be used. These APIs will classify user emotions (e.g., positive, negative, neutral) based on the input text, ensuring the system adapts its responses according to the user's mental state.

Data Cleaning and Normalization: Input data will be preprocessed to remove any noise or irrelevant details, ensuring that the model receives clean and meaningful text for processing. This includes handling misspellings, tokenization, and other natural language preprocessing steps.

2. Model Development and Integration

Model Selection: Depending on the finalized API (e.g., OpenAI, Hugging Face), either a pre-trained language model (like GPT) will be fine-tuned for mental health-related dialogues, or external APIs will directly handle the responses. Fine-tuning allows for a more specialized conversational flow, while the use of established APIs offers flexibility and ease of deployment.

API Integration: APIs will handle both conversation flow and sentiment analysis. The backend, developed using Django, will manage the integration of these APIs and ensure smooth interaction between the frontend (React-based) and the language models.

Training and Evaluation: If a custom model is deployed, it will undergo iterative training using mental health-related datasets, including both general conversations and specific therapy-related interactions. Hyperparameters will be optimized to ensure the chatbot can engage effectively without introducing biases or inappropriate responses.

3. Feature Extraction and Sentiment Analysis

Natural Language Understanding: User inputs will be processed to extract key phrases, emotions, and intents. Sentiment analysis APIs will classify the user's emotional state, which will dictate the tone and content of the chatbot's response.

Personalization: The chatbot will use user-specific details to offer personalized responses. For instance, users may log recurring feelings or issues, which can be referred to in subsequent sessions, allowing for more empathetic and tailored interactions.

4. User Interaction and Chatbot Workflow

Input Handling: The user will interact with the system via a web-based interface built using HTML, CSS, JS, and React. Upon submitting a query or sharing feelings, the frontend will relay this information to the backend via RESTful APIs.

Response Generation: The backend will process the user's input by calling the appropriate API for generating responses. The responses will be contextually relevant to the mental health conversation and sentiment detected in the input.

Real-time Feedback: The chatbot will provide immediate feedback, offering suggestions, motivational phrases, or resources such as mindfulness exercises, based on the sentiment analysis and context.

5. User Interface and Interaction Design

Frontend Development: A clean, intuitive, and user-friendly web interface will be designed to allow users to easily interact with the chatbot. The design will focus on simplicity and empathy, ensuring that users feel comfortable and supported throughout their interactions.

User Journey: The platform will allow users to share their thoughts or concerns in a text box, with sentiment analysis automatically applied to assess the emotional tone of the input. The chatbot will respond with empathetic messages and may suggest mental health resources or activities based on the context.

6. Classification and Feedback

Emotion Detection: The chatbot will leverage the sentiment analysis API to continuously gauge the emotional tone of the conversation. Based on predefined thresholds, responses will be modulated to ensure that the user receives appropriate emotional support.

7. Deployment and Scalability

Backend Integration: Django will handle the backend processes, including routing user inputs, processing API calls, and serving chatbot responses. The system will also maintain user sessions, manage authentication (if required), and securely store conversational data.

Web App Deployment: The deployment platform is not finalized yet, but options include cloud services like AWS, Azure, or Heroku.

This comprehensive methodology ensures that the mental health companion can efficiently handle a variety of mental health-related queries, provide timely emotional support, and assist users in managing their mental well-being.

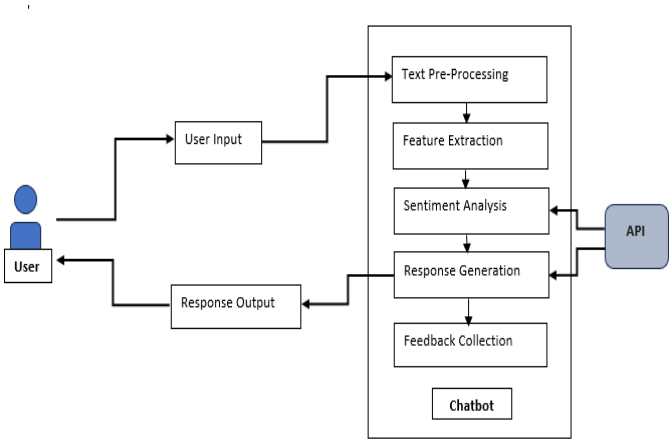

Fig. 1. System Architecture

Algorithm:

The algorithm for processing and responding to user queries in the AI-driven mental health companion consists of the following steps:

1. **Input Handling:**

User input is received via the chatbot interface on the web app.

2. **Query Parsing and Preprocessing**:

The input is tokenized, normalized, and lemmatized for consistent processing.

3. **Sentiment Analysis**:

The input is sent to a sentiment analysis API (e.g., Hugging Face or OpenAI) to determine the emotional tone (positive, negative, neutral).

4. **Response Generation**:

The query is sent to a chatbot API or fine-tuned model to generate a contextually relevant response.

5. **Feedback Collection**:

Feedback is collected in the backend to improve future interactions and system performance.

6. **Response Output**:

The system formats the final response and delivers it through the chatbot interface.

V. CONCLUSION

The proposed mental health companion system effectively integrates advanced AI technologies, such as chatbot APIs and sentiment analysis, to provide personalized and supportive mental health responses in real-time. By utilizing pretrained models or fine-tuned APIs, the system ensures accurate and empathetic interactions, tailored to the user's emotional state. The integration of a user-friendly web interface allows seamless access for users, ensuring ease of interaction and practical applicability. This approach offers a comprehensive solution for mental health support, providing a scalable framework that can be adapted for various use cases while enhancing user experience and engagement.

VI. REFERENCES

1. M. Agarwal, D. Chauhan, N. Yadav and S. Singhal, "Sakhi: AI-Generated Mental Health Companion," 2024 1st International Conference on Innovative Sustainable Technologies for Energy, Mechatronics, and Smart Systems (ISTEMS), Dehradun, India, 2024, pp. 1-6, doi: 10.1109/ISTEMS60181.2024.10560327.

2. Kumbhar, P.B., Vaidya, O.A., & Kulkarni, K.S. (2024). KrishnaVani: An AI-Powered Companion—Your AI Buddy for Student Mental Health Support. International Journal of Humanities Social Science and Management (IJHSSM), 4(3), 793-799. www.ijhssm.org. Date of Submission: 11-05-2024; Date of Acceptance: 23-05-2024.

3. N. Kallivalappil, K. D'Souza, A. Deshmukh, C. Kadam and N. Sharma, "Empath.ai: a Context-Aware Chatbot for Emotional Detection and Support," 2023 14th International Conference on Computing Communication and Networking Technologies (ICCCNT), Delhi, India, 2023, pp. 1-7, doi: 10.1109/ICCCNT56998.2023.10306584.

4. J. Limbachia, Y. Damani, S. Dave and V. Sagvekar, "MOODIFY: Tailored, Personal and Multifaceted AI Assistant for Young Adult Mental Health Issues," 2023 6th International Conference on Advances in Science and Technology (ICAST), Mumbai, India, 2023, pp. 106-110, doi: 10.1109/ICAST59062.2023.10455044.

5. Booth F, Potts C, Bond R, Mulvenna M, Kostenius C, Dhanapala I, Vakaloudis A, Cahill B, Kuosmanen L, Ennis E. A Mental Health and Well-Being Chatbot: User Event Log Analysis. JMIR Mhealth Uhealth. 2023 Jul 6;11:e43052. doi: 10.2196/43052. PMID: 37410539; PMCID: PMC10360018.

6. Sagar, V.P., & Koti, M.S. (2023). Artificial Intelligence-Based Chatbot for Mental Health. International Journal of Advance Research and Innovative Ideas in Education (IJARIIE), 9(4), 738. ISSN(O)-2395-4396.

7. More, Vivek & Koli, Viren & Vijaykumar, Vignesh & Jethani, Vimla. (2021). Chatbot for Mental Well-being. ITM Web of Conferences.40. 03019.10.1051/itmconf/20214003019.