RehabBot - AI Mental Health Therapist Chatbot

Mini Project (REVIEW-1)

Submitted by

AKSHAYAA M (212222230009)

SNEHA BASYAL M (212222240101)

LISIANA T (212222240053)

*in partial fulfillment for the
award of the degree of*

BACHELOR OF TECHNOLOGY

in

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE
AND
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

SAVEETHA ENGINEERING COLLEGE, THANDALAM

An Autonomous Institution Affiliated to

ANNA UNIVERSITY - CHENNAI 600 025

ABSTRACT

RehabBot - AI Mental Health Therapist Chatbot is a web-based application designed to provide mental health support using natural language processing through Dialogflow. The chatbot interface, built using HTML, CSS, and JavaScript, offers a user-friendly environment for individuals seeking mental health assistance. The application features a web-based interface as the main entry point for user interaction, which includes text input for chatting and a "Survey" button that opens a sleep survey to collect data on users' sleeping habits, generating a sleep rating that informs them about their sleep health. Utilizing Dialogflow, the chatbot employs intent recognition to analyze user inputs and detect mental health concerns, such as stress or anxiety, while entity extraction helps tailor responses to individual needs. Furthermore, the sleep rating system gathers data on hours of sleep, quality, and consistency, allowing RehabBot to calculate and display a sleep rating along with suggestions for improvement. By facilitating communication and offering supportive responses, RehabBot aims to enhance mental health accessibility, providing an initial level of assistance and guidance. The project is deployed on a web hosting platform, making it accessible to users anytime, anywhere.

LIST OF ABBREVIATIONS

- **AI** - Artificial Intelligence

- **API** - Application Programming Interface

- **NLP** - Natural Language Processing

- **UI** - User Interface

- **UX** - User Experience

- **ML** - Machine Learning

- **DB** - Database

- **FAQ** - Frequently Asked Questions

- **GDPR** - General Data Protection Regulation

- **HIPAA** - Health Insurance Portability and Accountability Act

- **WHO** - World Health Organization

- **JSON** - JavaScript Object Notation

- **HTTPS** - Hypertext Transfer Protocol Secure

- **SDK** - Software Development Kit

- **MVC** - Model-View-Controller

TABLE OF CONTENTS

CHAPTER NO	TITLE	PAGE NO

1. INTRODUCTION

RehabBot is an innovative AI-powered mental health chatbot designed to provide immediate and accessible support for individuals facing mental health challenges. In a world where mental well-being is increasingly vital, yet often difficult to access, RehabBot leverages advanced natural language processing capabilities to understand user emotions and intents accurately.

This allows the chatbot to offer personalized responses that include practical advice, coping strategies, and relevant resources tailored to individual needs. By integrating a user-friendly web interface, RehabBot ensures that users can engage in safe, anonymous conversations about their mental health at any time.

Ultimately, RehabBot aims to empower users in their journey toward emotional wellness, contributing positively to the digital mental health landscape and reducing barriers to seeking help.

2. PROBLEM DEFINITION

Many individuals face significant barriers in accessing mental health support, including a shortage of professionals, high treatment costs, and the stigma associated with seeking help. According to the World Health Organization, around 1 in 5 people will experience a mental health issue, yet many do not receive necessary assistance due to these obstacles. RehabBot, the AI mental health chatbot, aims to address this issue by providing a confidential, accessible platform for users to engage in conversations about their mental health and receive personalized advice and coping strategies, thereby bridging the gap in mental health resources.

3. OBJECTIVES

- Provide Accessible Mental Health Support

- Integrate a sleep survey

- Ensure data privacy and security

- User-friendly web interface

- Promote Mental Health Awareness and Education

4. LITERATURE SURVEY

SL NO	YEAR	AUTHORS	PAPER TITLE	PROBLEM STATEMENT	PROBLEM METHODOLOGIES	ADVANTAGES	DRAWBACKS	FUTURE SCOPE
1	2022	Kay T. Pham, Amir Nabizadeh, Salih Selek	Artificial Intelligence and Chatbots in Psychiatr	The need for improved access to mental health solutions amidst provider shortages. .	Review of existing AI applications in psychiatry, including chatbots and their functionalities.	Increased accessibility to mental health care, cost-effectiveness, and reduced stigma.	Limited ability to provide nuanced emotional support compared to human therapists..	Investigate efficacy of AI-based interventions in controlled trials and integration into clinical practice.

2	2024	Inhwa Song et al.	The Typing Cure: Experiences with Large Language Model Chatbots for Mental Health Support	The need for understanding user experiences with LLM chatbots in mental health contexts.	Semi-structured interviews with users to analyze their interactions and perceptions of LLM chatbots.	Users find chatbots to be non-judgmental and supportive, filling gaps in traditional care.	Cultural limitations and potential for harmful advice if not designed responsibly.	Recommendations for designing ethically aligned AI tools in mental health support.
3	2023	Zoha Khawaja, Jean-Christophe Bélisle-Pipon	Your Robot Therapist is Not Your Therapist: Understanding the Role of AI-Powered Mental Health Chatbots	Users may misunderstand the capabilities and limitations of AI chatbots, leading to therapeutic misconceptions.	Exploration of ethical implications and user experiences with AI chatbots through qualitative analysis.	Potential to increase access to mental health support and reduce barriers to seeking help.	Risks of inadequate support and algorithmic bias, leading to harmful advice.	Development of ethical guidelines for AI chatbots and user education on limitations.

#	Year	Authors	Title	Problem Addressed	Methodology / Proposal	Benefits	Limitations	Future Work
4	2023	Kaushik Roy et al.	Demonstrating Artificial Intelligence Enabled Virtual Assistance for Telehealth: The Mental Health Case	Addressing the challenges of personalized patient understanding and safety in chatbot interactions.	Proposal of a modular chatbot design that integrates patient-specific information with clinical knowledge.	Personalized care and improved understanding between patients and clinicians.	Complexity in ensuring safety and accuracy in chatbot responses.	Continuous refinement of chatbot design based on user feedback and clinical guidelines.
5	2023	Batyrkhan Omarov, Sergazi Narynov	AI-Enabled Chatbots in Mental Health: A Systematic Review	Ethical and social challenges in the widespread adoption of AI-enabled mental health chatbots.	Systematic review of 35 studies, exploring chatbot technologies, psychological therapies (CBT, DBT), and machine learning models.	Integration of AI chatbots with existing mental health services, cost-effective treatment for underserved populations	Ethical concerns regarding data privacy, misuse of AI chatbots for vulnerable populations, and lack of human intervention in critical moments	More research into ethical AI chatbot design and exploring more personalized AI for different psychiatric conditions.
6	2023	Lennart Brocki, George C. Dyer, Anna Gładka, Neo Christopher Chung	Deep Learning Mental Health Dialogue System	The challenge of limited access to mental health counseling due to cost, stigma, fear, and availability. The need for accessible alternatives to traditional counseling.	Developed a deep learning dialogue system called **Serena** using a 2.7 billion parameter Seq2Seq Transformer. Post-processing algorithms like contradiction detection, toxic language filtering, and repetitive answer removal are applied. Deployed using Google Kubernetes Engine.	Provides low-cost, scalable, and accessible mental health counseling. Reduces stigma associated with traditional therapy. Real-time, responsive, and empathetic interactions.	Issues of hallucinations and incoherent responses from the model. Serena's tendency to ask only questions is perceived as annoying.	Improve UX/UI through focus groups. Address hallucinations and repetitive questioning behavior. Explore balancing questions and statements in the training data. Encrypt user data for privacy protection..
7	2023	Johanna Habicht, Sruthi Viswanathan, Ben Carrington, Tobias Hauser, Ross Harper, Max Rollwage	Closing the Accessibility Gap to Mental Health Treatment with a Conversational AI-Enabled Self-Referral Tool	Barriers to accessing mental health care, particularly for minority groups, leading to lower referral rates and treatment access.	Implementation of an AI-enabled self-referral tool (chatbot) in NHS Talking Therapies services. Conducted a multi-site real-world observational study analyzing referral data before and after implementation. NLP and thematic analysis were used to process qualitative feedback.	Increased total referrals by 15%, with a disproportionately larger impact on minority groups such as non-binary, bisexual, and ethnic minorities. Provided human-free interaction, reducing stigma, and offering convenience and flexibility.	Limited by cultural differences in service uptake. Some feedback indicated delays in expected support after referrals.	Explore more personalization and fine-tune the tool to address specific barriers faced by different demographic groups. Increase AI's role in post-referral assessments to reduce wait times.

8	2023	Batyrkhan Omarov, Zhandos Zhumanov, Aidana Gumar, Leilya Kuntunova	Artificial Intelligence Enabled Mobile Chatbot Psychologist Using AIML and Cognitive Behavioral Therapy	The rising demand for mental health services, with limited access due to cost, stigma, and resource shortages, necessitates cost-effective, accessible solutions	The chatbot uses AIML (Artificial Intelligence Markup Language) and CBT (Cognitive Behavioral Therapy) to provide personalized psychological support. It features a knowledge base of CBT techniques, RASA NLU for natural language processing, and a conversational engine for user interaction.	Accessible, cost-effective mental health care solution, delivering CBT interventions at scale. Users reported improved mental well-being and personalization of support.	Privacy concerns, ethical considerations regarding accuracy, and dependence on AI for mental health. Not a full replacement for professional therapy.	Integration of additional therapies like DBT or ACT, enhanced multimodal inputs (voice, emotion recognition), improved natural language processing, and real-world implementation evaluations.
9	2020	Dosovitsky, Pineda, Jacobson, Chang, Escoredo, Bunge	Artificial Intelligence Chatbot for Depression: Descriptive Study of Usage	There is limited information on how people use AI chatbots for depression, making it difficult to design better interventions.	Analyzed interactions of 354 users with the chatbot 'Tess' using descriptive statistics and flow analysis.	Chatbots offer scalable solutions for mental health interventions with personalized responses.	Large heterogeneity in user engagement; limited understanding of usage patterns.	Further research is needed to optimize chatbot design and improve usage patterns to enhance mental health care.

5. EXISTING SYSTEM

The current landscape of mental health support through AI-powered chatbots has seen substantial development, utilizing advancements in artificial intelligence and natural language processing to provide accessible, efficient, and cost-effective mental health care. AI-based mental health chatbots are gaining traction for their potential to complement traditional therapy, especially for users who face barriers to accessing in-person care.

Kay et al. discuss the role of AI and chatbots in psychiatry, emphasizing their use in screening, early detection of mental health issues, and providing immediate assistance for mild to moderate psychiatric symptoms. However, the integration of these technologies raises ethical and clinical challenges, particularly regarding data privacy and the adequacy of responses provided by chatbots (Kay, Nabizadeh, & Selek, 2022) [1].

Zohra et al. highlight a critical aspect of the existing system—AI-powered chatbots often create an illusion of human empathy and understanding, despite their lack of true emotional comprehension. They stress that while chatbots may be helpful tools, they should not be considered substitutes for human therapists (Zohra, Khawaja, & Belisle-Pipon, 2023) [2]. Their use should be primarily for initial support and referrals, with human professionals remaining integral to comprehensive treatment.

Song et al. present findings on user experiences with large language model-based chatbots for mental health support. These AI chatbots are effective in providing comforting responses, which can reduce anxiety and improve user mood. However, they do not entirely replace the personalized care offered by human therapists (Song et al., 2024) [3]. The research underscores the mixed nature of user satisfaction, with some participants reporting limitations in the depth of understanding and empathy in these chatbot responses.

Roy et al. demonstrate "Alleviate," a virtual assistant for telehealth that employs AI to enhance mental health support services. The system showcases the ability to perform preliminary assessments, offer therapeutic conversations, and facilitate users in connecting with professionals. However, the challenge remains to ensure that the chatbot's advice aligns with best practices and does not mislead users during critical health scenarios (Roy et al., 2023) [4].

Batyrkhan et al. provide a systematic review of AI-enabled chatbots in mental health, which shows that while such systems have a positive impact on expanding accessibility to mental health services, issues like cultural sensitivity, limited personalization, and reliability of interventions are significant hurdles (Batyrkhan et al., 2023) [5]. Many chatbots fail to adapt to the nuanced needs of diverse populations, limiting their efficacy.

Dotskovsky et al. conducted a descriptive study on an AI chatbot designed specifically for managing symptoms of depression. The study found that users benefited from the non-judgmental and easily accessible nature of the chatbot, which reduced barriers to seeking help (Dotskovsky et al., 2020) [6]. However, the authors also noted the importance of guiding users to professional care when severe symptoms were detected.

Johanna et al. address the accessibility gap in mental health treatment by introducing a conversational AI-enabled self-referral tool. Their research demonstrates that such tools can significantly bridge the gap for individuals who may not have easy access to mental health resources (Johanna et al., 2023) [7]. Yet, they also emphasize that while chatbots can serve as the first step, they must be followed up with professional intervention to ensure proper care.

Brock et al. developed a deep learning-based mental health dialogue system aimed at facilitating empathetic interactions. Their findings illustrate that, while AI dialogue systems have evolved in their ability to process and understand natural language, the challenge of achieving consistent empathy and context-aware responses remains a major limitation (Brock et al., 2023) [8].

Lastly, Batyrkhan et al. explored the use of AI-enabled chatbot psychologists in delivering Cognitive Behavioral Therapy (CBT). Their study showed that these chatbots are effective for providing structured CBT sessions, helping users identify negative thought patterns and work on behavioral changes (Batyrkhan et al., 2023) [9]. However, the efficacy of such systems is often reduced due to a lack of personalization and real-time emotional feedback, which are vital in therapy.

6. SYSTEM ARCHITECTURE
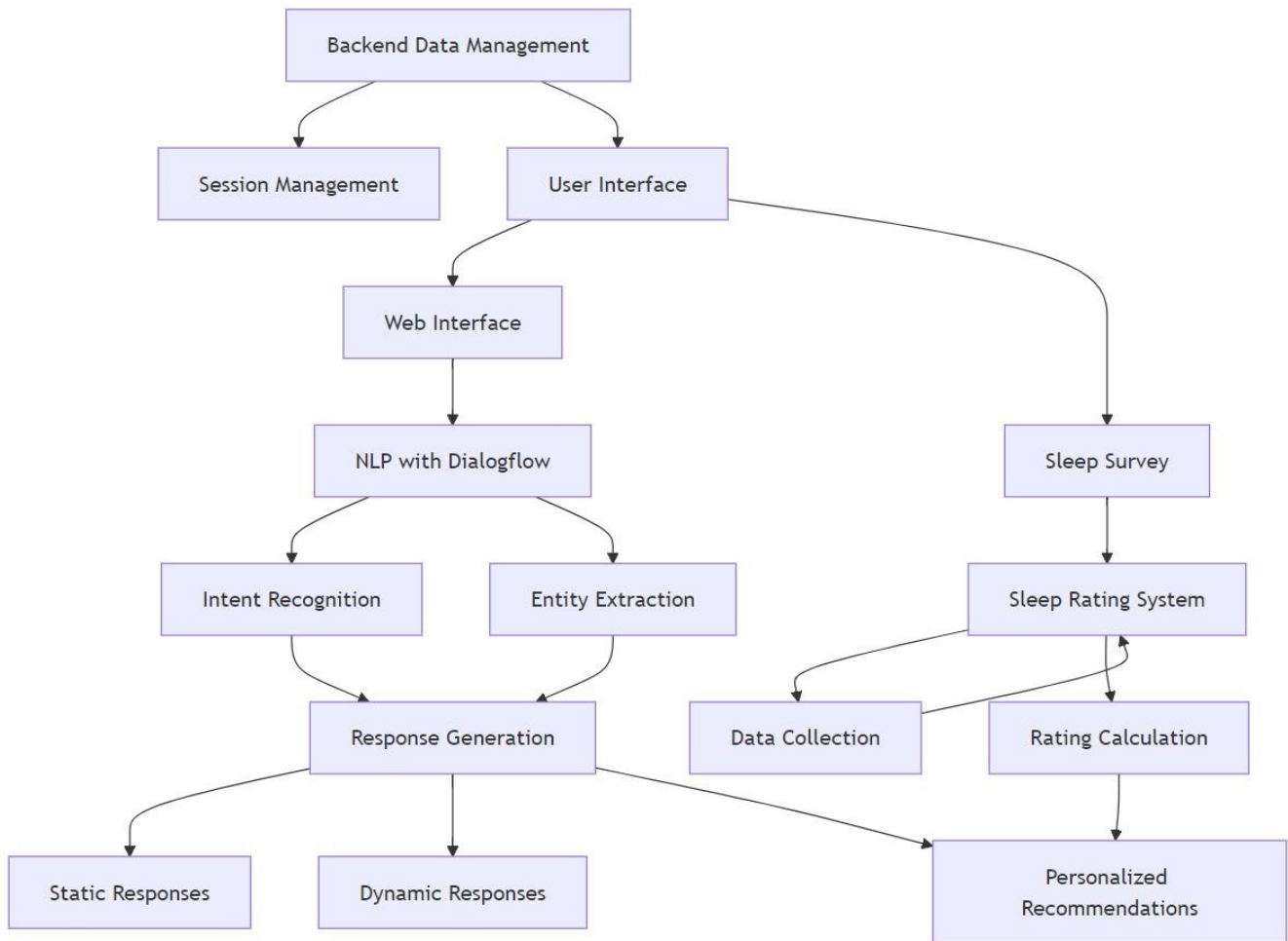
7. PROPOSED SYSTEM

1. User Interface (UI):

   - Web-Based Interface: The main entry point where users can interact with RehabBot. It will include text input for chatting, a "Survey" button for the sleep rating feature, and easy navigation to encourage user engagement.

   - Sleep Survey Button: This button, when clicked, opens a survey to collect data on the user's sleeping habits, generating a sleep rating that informs the user of their sleep health

2. Natural Language Processing (NLP) with Dialogflow:

   - Intent Recognition: Dialogflow will analyze user inputs to detect mental health concerns, such as stress or anxiety, and respond with relevant advice.

   - Entity Extraction: The chatbot will identify specific user concerns or terms, helping it to tailor responses that better match individual needs.

3. Sleep Rating System:

   - Data Collection: Through the sleep survey, the system will gather data on hours of sleep, sleep quality, and consistency.

   - Rating Calculation: Based on the collected data, RehabBot will calculate a sleep rating and display it to the user, along with suggestions to improve sleep where applicable.

4. Backend Data Management:

   - Session Management: The backend will handle user sessions and store temporary data, ensuring smooth transitions and responses.

5. Response Generation and Customization:

   - Static and Dynamic Responses: RehabBot will use predefined responses for common mental health topics,

   - Personalized Recommendations: Based on user inputs and sleep survey results, RehabBot will offer tailored suggestions for mental health and sleep improvements.

6. Data Privacy and Security:

   - Confidentiality: The system will prioritize user privacy by implementing secure data handling practices, ensuring sensitive information is not stored beyond the session unless explicitly permitted by the user.

   - Compliance: RehabBot will be designed to align with data protection regulations like GDPR or HIPAA to ensure compliance and protect user data

Conclusion:

The RehabBot project brings together AI and mental health support in a user-friendly platform designed to provide personalized, real-time assistance. By integrating a Dialogflow-powered chatbot into the interface, RehabBot is able to offer tailored advice and guidance on various mental health concerns. The addition of the sleep survey feature enhances the platform's holistic approach by incorporating sleep health into overall mental well-being. Ensuring compliance with GDPR and HIPAA regulations, RehabBot protects user privacy and fosters a secure, confidential environment. Ultimately, RehabBot aims to provide an accessible and trustworthy mental health resource for users seeking support.

8. REFERENCES

[1] Kay T. Pham, Amir Nabizadeh, Salih Selek.Artificial Intelligence and Chatbots in Psychiatry-February-2022

[2] Zoha Khawaja, Jean-Christophe Bélisle-Pipon.Your Robot Therapist is Not Your Therapist: Understanding the Role of AI-Powered Mental Health Chatbots-November 2023

[3] Inhwa Song et al.The Typing Cure: Experiences with Large Language Model Chatbots for Mental Health Support.arXiv:2401.14362v2 [cs.HC] 6 Mar 2024

[4] Kaushik Roy et al.Demo Alleviate: Demonstrating Artificial Intelligence Enabled Virtual Assistance for Telehealth:The Mental Health Casee.arXiv:2304.00025v1 [cs.CL] 31 Mar 2023

[5] Batyrkhan Omarov, Sergazi Narynov. AI-Enabled Chatbots in Mental Health: A Systematic Review.10.32604/cmc.2023.034655- September 2022

[6]Lennart Brocki, George C. Dyer, Anna Gładka, Neo Christopher Chung.Deep Learning Mental Health Dialogue System.arXiv:2301.09412v1 [cs.CL] 23 Jan 2023

[7] Johanna Habicht, Sruthi Viswanathan, Ben Carrington, Tobias Hauser, Ross Harper, Max Rollwage.Closing the Accessibility Gap to Mental Health Treatment with a Conversational AI-Enabled Self-Referral Tool.10.1101/2023.04.29.23289204 - May 2023

[8] Batyrkhan Omarov, Zhandos Zhumanov, Aidana Gumar, Leilya Kuntunov.Artificial Intelligence Enabled Mobile Chatbot Psychologist Using AIML and Cognitive Behavioral Therapy.(IJACSA) International Journal of Advanced Computer Science and Applications,Vol. 14, No. 6, 2023

[9] Dosovitsky, Pineda, Jacobson, Chang, Escoredo, Bunge. Artificial Intelligence Chatbot for Depression: Descriptive Study of Usage.JMIR Form Res 2020;4(11):e17065 - 2020

9. CONCLUSION

The RehabBot project brings together AI and mental health support in a user-friendly platform designed to provide personalized, real-time assistance. By integrating a Dialogflow-powered chatbot into the interface, Rehabbot is able to offer tailored advice and guidance on various mental health concerns. The addition of the sleep survey feature enhances the platform's holistic approach by incorporating sleep health into overall mental well-being. Ensuring compliance with GDPR and HIPAA regulations, RehabBot protects user privacy and fosters a secure, confidential environment. Ultimately, RehabBot aims to provide an accessible and trustworthy mental health resource for users seeking support.