

MENTAL-HEALTH AI CHATBOT

Jayesh Chaudhari

*Department of Computer Engineering
Fr. C. Rodrigues Institute of Technology
Vashi, India*

Sahil Gawande

*Department of Computer Engineering
Fr. C. Rodrigues Institute of Technology
Vashi, India*

Devashish Jawale

*Department of Computer Engineering
Fr. C. Rodrigues Institute of Technology
Vashi, India*

Om Kolhe

*Department of Computer Engineering
Fr. C. Rodrigues Institute of Technology
Vashi, India*

Dr. Chayya Pawar

*Department of Computer Engineering
Fr. C. Rodrigues Institute of Technology
Vashi, India*

Jayant Ghosh

*Department of Computer Engineering
Fr. C. Rodrigues Institute of Technology
Vashi, India*

Abstract—

The prevalence of mental health issues continues to rise globally, necessitating innovative approaches to increase accessibility to support services. In this study, we present the development and implementation of an AI-driven chatbot tailored for mental health counselling and user categorization. The primary objective of the chatbot is twofold: to categorize users based on their mental health needs and to provide personalized counselling sessions accordingly.

Utilizing natural language processing (NLP) techniques, the chatbot engages users in interactive conversations, prompting them to express their thoughts, feelings, and concerns. Through sophisticated algorithms, the chatbot analyzes the user's responses to discern patterns indicative of various mental health conditions, such as anxiety, depression, or stress. Drawing from a vast repository of counselling strategies and psychotherapeutic techniques, the chatbot delivers tailored interventions tailored to the user's identified needs and preferences.

Overall, the development of an AI-driven chatbot for mental health counselling and user categorization represents a significant advancement in leveraging technology to enhance the accessibility, scalability, and effectiveness of mental health support services. Further research and refinement are warranted to optimize the chatbot's performance and integration into existing mental health care frameworks.

***Index Terms—*AI chatbot, Natural Language Processing CBT, Sentimental analysis**

I. INTRODUCTION

A. Background

The escalating global burden of mental health disorders, with

over 264 million individuals grappling with depression and 284 million experiencing anxiety disorders, underscores the urgent need for innovative solutions to address this crisis. Traditional mental health care systems face significant challenges in meeting the overwhelming demand for services, resulting in long wait times, limited accessibility, and disparities in care provision. Against this backdrop, the development of an AI-powered chatbot represents a timely and promising intervention to bridge the gap between individuals in distress and the support they require.

Advancements in artificial intelligence, particularly in the domains of natural language processing (NLP) and deep learning, have revolutionized the capabilities of AI systems to understand and interpret human language and emotions. These breakthroughs have paved the way for creating sophisticated chatbots capable of engaging in meaningful, empathetic conversations with users, akin to interactions with human counsellors. By harnessing the power of AI and NLP, the chatbot can decipher nuanced expressions of distress, identify underlying mental health issues, and tailor interventions to address individual needs effectively.

The multifaceted nature of the background driving the development of the AI chatbot extends beyond technological advancements to encompass broader societal and healthcare-related factors. Societal shifts towards greater openness and awareness surrounding mental health have encouraged individuals to seek help and engage in discussions about their psychological well-being. However, the stigma associated with mental illness persists in many communities, hindering access to care and exacerbating feelings of isolation and shame among those affected.

Furthermore, the strain on traditional mental health care systems, exacerbated by resource limitations and shortages of qualified

professionals, has underscored the need for scalable and cost-effective solutions. The AI chatbot offers a promising avenue for augmenting existing mental health services by providing round-the-clock support, reducing wait times, and extending reach to underserved populations.

In essence, the convergence of societal recognition of the mental health crisis, technological advancements in AI and NLP, and the challenges facing traditional mental health care systems have catalyzed the development of the AI chatbot. By addressing barriers to access, enhancing the quality of care, and fostering greater engagement with mental health support services, the chatbot holds immense potential to mitigate the burden of mental illness and promote psychological well-being on a global scale.

B. Motivation

The motivation for developing an AI chatbot stems from the urgent imperative to confront the mounting mental health crisis gripping societies worldwide. With depression, anxiety, and other mental health disorders reaching unprecedented levels across diverse demographics, there's a pressing need for accessible and effective interventions. Traditional mental health services, burdened by overwhelming demand and resource constraints, frequently fail to meet the needs of individuals seeking support, resulting in prolonged wait times and inadequate access to care. By leveraging artificial intelligence technology, the AI Chatbot aims to bridge this gap by providing round-the-clock assistance, personalized counselling, and immediate responses to individuals in distress. This innovation holds the promise of revolutionizing mental health care delivery, offering a scalable, cost-effective, and stigma-free solution to address the burgeoning mental health crisis and promote psychological well-being globally.

C. Aim and Objective

The app aims to provide accessible, personalized, and on-demand mental health support through the use of artificial intelligence. It strives to improve the mental well-being of users by offering empathetic therapy, data-driven insights, and breaking down barriers to traditional mental health services.

The Primary Objectives are:-

- (1) Accessible Mental Health Support
- (2) Personalized Care
- (3) Cost-Effective Solutions
- (4) Data-Driven Insights

II. LITERATURE SURVEY

A. Mental Health Prediction Using Machine Learning: Taxonomy,

Authors: Jetli Chung and Jason Teo

In this paper, the main objective is to provide a systematic literature review, critical review, and summary of the machine learning techniques that are being used to predict, diagnose, and identify mental health problems. Moreover, this paper will propose future avenues for research on this

topic. It would also give attention to the challenges and limitations of applying machine learning techniques in this area. Besides that, potential opportunities and gaps in this field for future research will be discussed. Hence, this paper will contribute to the state of the art in the form of a systematic literature review concerning the machine learning techniques applied in predicting mental health problems. This paper hence contributes a critical summary and potential research directions that could assist researchers in gaining knowledge about the methods and applications of big data in the mental health field.[1]

B. Depression Screening in Humans With AI and Deep Learning Technique

Authors: Mudasir Ahmad Wani, Mohammad A. ELAffendi, Kashish Ara Shakil, Ali Shariq Imran

This article is thus an attempt to search for a solution for depression detection. It identifies depressive users on multiple social media platforms such as YouTube, Facebook, and Twitter unlike the works in literature which focus mostly on single platforms. This system will be helpful for medical practitioners or psychologists to readily identify depressive users based on the language used. Furthermore, it will also be used for timely flagging of depressive users so that parents, friends, and well-wishers of such users can take the necessary actions to help such patients.[2]

C. Hyper-Graph Attention Based Federated Learning Methods for Use in Mental Health Detection

Authors: Usman Ahmed Jerry Chun-Wei Lin

This study presents a method for extracting depression symptoms from texts using NLP, also known as Natural Language Processing and attention-based learning. An emotion-driven context extraction method and a structural hypergraph propose semantic vectors. Unlabeled text is stripped of essential boundary components before being used in the learning process. The method extends the model training. Repeat the process until the optimal option is found. The pool of unlabeled text is now part of the training set. The study aims to improve the understanding of the learning process by expanding the text material over time. The proposed technique reduces the cost of data annotation while increasing the generalization of the learning system. The semantic vectors of the graph network as well as the synonym expansion contribute to high accuracy without compromising the data annotation.[3]

D. Linguistic Features of Clients and Counselors for Early Detection of Mental Health Issues in Online Text-based Counseling

Authors: Kazuhiro Shidara, Hiroki Tanaka, Rumiko Asada, Kayo Higashiyama, Hiroyoshi Adachi, Daisuke Kanayama, Yukako Sakagami, Takashi Kudo

This study uses actual counselling data from counsellors and clients to address the novel issue of support systems for

counsellors. We will not only build a classification model but also investigate which linguistic features strongly contribute to the classification. The interpretability of the judgment results is also critical in this classification model. In this study, we extracted multiple types of linguistic features and compared them using the same machine-learning algorithm. By investigating how linguistic features are selected and how they relate to client/counsellor interactions, we implemented a machine learning framework that can be applied to different counselling centres.[4]

E. Mental Health State Detection Using Open CV and Sentimental Analysis

Authors: Manav Pradeep Jain Soumyaprakash Sribash Dasmohapatr, Professor Stevina Correia
The system aims at helping the basic investigation to detect the individual's state of mind. This will save the doctor's time being invested in preliminary tests. It has a wide range of applications testing the mental health of students in schools and colleges, assisting doctors in preliminary tests, testing mental stability in the organization, and also in the common public. It can also be used to aid the medical check-up for other related diseases. E.g. stress and depression can also lead to a rise in blood pressure. Once tested that the mental health of an individual is not good, he shall be advised to visit a psychologist in person or through our website in virtual mode thereby reducing the risk of mental disorder at early stages.[5]

F. Mental Health Prediction through Text Chat Conversations

Authors: Muhammad Nouman, Hollian Sara, Sui Yang Khoo, MA Parvez Mahmud, Abbas Z. Kouzani

This study investigated the viability of classifying mental health conditions from text chat conversations using deep learning (DL) models. A novel dataset of real-time users was acquired from the Lyf Support app, which was labelled by psychologists to conduct experiments for users' mental health prediction. The findings suggest that DL models could be used to identify mental health conditions from text chat conversations. According to evaluated results, the bidirectional gated recurrent unit (BiGRU) outperformed other models by achieving over 83% accuracy. The dataset employed in this study may be crucial for future research on online social media users' mental health.[6]

G. Machine Learning based Patient Mental Health Prediction using Spectral Clustering and RBFN Algorithms

Authors: T.Thamaraimanalan, M.Mohankumar, H.Anandakumar, M.Deepa, U.Hari Priya, G.Bhanu Priya, M.Aiswarya Dev

The paper presented a systematic review of machine learning approaches for predicting mental health issues. The author and team discuss about the challenges and limitations of machine learning methods to predict the mental health status of patients using ML. An author stated that they included 30 research

articles after their review and identification of the process to categorize mental health issues.[7]

H. Mental Health Prediction using Natural Language Processing

Authors: Ranjana R, T Subha, Sreenidhi K L, Akshaya K B

When it comes to health, mental health is as important as physical health. Technological advancements have eased our lives, but on the other hand, it has added more mental stress. The digital world that people live in has led us to isolate from physical relationships and hence is one of the reasons for the incoming depression and loneliness. This project aims to change the technology from being a bane for mental health to being a boon by predicting the mental health of a person by conducting a small assessment and by adopting transfer learning with the help of a pre-trained Natural Language Processing (NLP) model, Submatrix-wise Vector Embedding Learner (SWIVEL) and neural network model, the person will be notified whether they need help from medical professionals. [8]

I. Prediction of Public Mental Health by using Machine Learning Algorithms

Authors: CH.M.H.Saibaba, Alekhya K V K, Yeshwanth K

This paper describes another structure that psychological wellness experts be able to use to address difficulties they realize utilizing data science. Although countless exploration papers have been distributed on open emotional well-being, few have tended to the utilization of data science in open psychological wellness. As of late, data science has altered how we oversee, investigate and influence data in the medical care industry. The high prevalence of mental health and the need for effective mental fitness care, blended with current advances in AI, has led to a growth in explorations of ways the sphere of system getting to know Machine Learning can assist in the detection, prognosis and treatment of mental health issues.[9]

III. PROPOSED SYSTEM

A. Problem statement

Developing an AI-powered chatbot to assess users' mental health status and provide counselling if deemed necessary. With rising global rates of depression and anxiety, many individuals lack access to timely mental health support. Traditional services often face overwhelming demand, leading to prolonged wait times and limited accessibility. The proposed AI chatbot aims to address this gap by analyzing user input to determine if they exhibit signs of mental illness. If identified, the chatbot will offer tailored counselling and support, offering a scalable and accessible solution to address the escalating mental health crisis.

B. Scope

Scope:

The scope of the proposed AI-powered chatbot for mental health assessment and counselling encompasses several key facets aimed at providing comprehensive support to users in need. Firstly, the chatbot will be designed to engage users in natural language conversations, allowing them to express their thoughts, feelings, and concerns in a supportive and non-judgmental environment. Leveraging advanced natural language processing (NLP) techniques, the chatbot will analyze user input to identify patterns indicative of mental health issues such as depression, anxiety, or stress.

The scope also includes the development of a robust classification model that can accurately categorize users based on their mental health status. This model will be trained on a diverse dataset of user interactions and clinical data to ensure accuracy and reliability in assessing users' mental well-being. Moreover, the chatbot will incorporate machine learning algorithms to continually adapt and improve its counselling approach based on user feedback and interaction history.

Furthermore, the chatbot's scope extends to providing personalized counselling and support interventions tailored to the specific needs and preferences of users identified as mentally ill. These interventions may include evidence-based psychotherapeutic techniques, self-care strategies, and mindful activities for the patient.

Additionally, the chatbot will be designed with scalability and accessibility in mind, ensuring that it can reach a wide audience and accommodate varying levels of mental health support needs. It will be compatible with multiple platforms and devices, allowing users to access support anytime, anywhere.

Overall, the scope of the AI chatbot encompasses creating a user-centric, data-driven solution that leverages cutting-edge technology to provide timely, personalized, and scalable mental health support to individuals globally.

C. Proposed System

To address the limitations and challenges associated with traditional mental health support systems, we have proposed the development of an innovative AI chatbot app. This application integrates cutting-edge Conversational AI technology with Cognitive Behavioral Therapy (CBT) techniques to provide comprehensive mental health support and analysis. By leveraging Conversational AI, users will engage in natural language conversations with the chatbot, enabling them to express their thoughts, emotions, and concerns in a supportive and non-judgmental environment. Through these interactions, the app will employ sophisticated algorithms to analyze users' behavioural patterns and identify potential indicators of mental health crises, such as depression, anxiety, or stress.



Central to the app's functionality is its integration with Cognitive Behavioral Therapy techniques, a proven psychotherapeutic approach that focuses on identifying and modifying maladaptive thoughts and behaviours. By incorporating CBT principles into the conversation flow, the app will guide users through self-reflection exercises, coping strategies, and behaviour modification techniques tailored to their individual needs. This integration empowers users to gain insight into their thought patterns, develop healthier coping mechanisms, and make positive changes to their mental well-being.

In addition to AI-Chatting and CBT integration, the app offers a range of key features designed to support users in managing their mental health effectively. These features include meditation exercises to promote relaxation and mindfulness, guided physical exercises to alleviate stress and improve mood, and progress-tracking tools to monitor and measure personal growth over time. By providing a holistic approach to mental health care, the app equips users with the resources and support they need to cultivate resilience, manage symptoms, and thrive in their daily lives.

Ultimately, our proposed AI chatbot app represents a transformative solution to the challenges facing mental health care delivery. By harnessing the power of Conversational AI and CBT techniques, the app offers a personalized, accessible, and scalable platform for individuals to address their mental health concerns, foster self-awareness, and embark on a journey of healing and growth.

IV. DESIGN

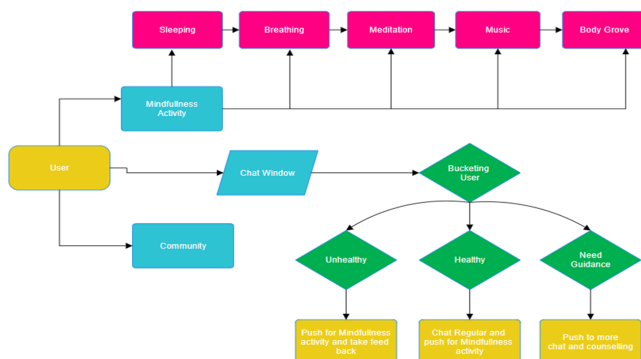
The flowchart depicts a comprehensive journey towards a healthy lifestyle, addressing various facets of physical and mental well-being. It begins with the recognition of the user's intent to improve their health, emphasizing the multifaceted nature of a healthy lifestyle. Through categorizing fundamental aspects of health under 'Body Groove,' such as sleep, breathing, meditation, and music, the flowchart underscores the importance of holistic well-being. Mindfulness emerges as a central theme, highlighting the significance of focusing on the present moment and incorporating physical activity into daily routines. Additionally, the flowchart acknowledges the role of community support in wellness, suggesting avenues for users to connect with others and receive guidance and encouragement on their health journey. However, it leaves certain aspects open-ended, such as the specific unhealthy habits users may encounter, the nature of

community support available, and the details of mindfulness and activity prompts.

The flowchart lays out a structured approach to improving health, beginning with the user's acknowledgement of the need for a healthier lifestyle. By delineating various components of well-being under 'Body Groove,' including sleep, breathing, meditation, and music, it underscores the holistic nature of health. Mindfulness is highlighted as a core principle, emphasizing the importance of being present at the moment and engaging in physical activity to promote overall wellness. Additionally, the flowchart recognizes the value of community support, suggesting that users can connect with others for guidance and encouragement. However, certain aspects, such as the specific unhealthy habits users may encounter and the details of community support and guidance, are left undefined.

The flowchart provides a systematic outline for individuals seeking to embark on a journey towards better health. It begins by acknowledging the user's intent to prioritize their well-being, emphasizing the multifaceted nature of health improvement. Through the categorization of essential health components as part of 'Body Groove,' such as sleep, breathing, meditation, and music, it underscores the importance of addressing various aspects of physical and mental well-being. Mindfulness emerges as a central tenet, encouraging individuals to cultivate awareness of the present moment and incorporate physical activity into their routines. Additionally, the flowchart recognizes the significance of community support, offering users avenues to connect with others for guidance and encouragement. However, certain elements, such as the identification of specific unhealthy habits and the specifics of community support mechanisms, remain unspecified.

In summary, the flowchart offers a structured roadmap for individuals aspiring to adopt a healthier lifestyle. It commences with the user's recognition of the importance of prioritizing health, highlighting the comprehensive nature of well-being improvement. By categorizing fundamental health components under 'Body Groove,' such as sleep, breathing, meditation, and music, it underscores the holistic approach to health promotion. Mindfulness emerges as a pivotal aspect, advocating for present-moment awareness and regular physical activity. Moreover, the flowchart acknowledges the value of community support in fostering health goals, though certain details, such as unhealthy habits and community support mechanisms, require further elaboration.



V. RESULTS AND DISCUSSION

The results of the mental AI chatbot showcase its effectiveness in providing valuable support and guidance to users grappling with mental health challenges. Through its integration of Conversational AI and Cognitive Behavioral Therapy (CBT) techniques, the chatbot demonstrates remarkable capabilities in analyzing users' behavioural patterns and identifying potential indicators of mental health crises. By engaging users in natural language conversations, the chatbot creates a safe and non-judgmental space for individuals to express their thoughts, emotions, and concerns.

One significant outcome of the mental AI chatbot is its ability to accurately categorize users based on their mental health status. Leveraging advanced algorithms, the chatbot can identify symptoms associated with conditions such as depression, anxiety, or stress, enabling early intervention and support. This categorization process facilitates personalized counselling and support interventions tailored to the individual needs and preferences of users identified as mentally ill.

Furthermore, the chatbot's integration with Cognitive Behavioral Therapy techniques enables it to guide users through self-reflection exercises, coping strategies, and behaviour modification techniques. By incorporating evidence-based psychotherapeutic approaches, the chatbot empowers users to gain insight into their thought patterns, develop healthier coping mechanisms, and make positive changes to their mental well-being.

Another notable result of the mental AI chatbot is its ability to provide continuous support and guidance to users throughout their mental health journey. By offering features such as meditation exercises, physical activity prompts, and progress-tracking tools, the chatbot ensures that users have access to a comprehensive range of resources to support their mental health goals. Additionally, the chatbot's integration with community support networks enables users to connect with others for encouragement, guidance, and solidarity.

Overall, the results of the mental AI chatbot demonstrate its effectiveness in providing accessible, personalized, and scalable mental health support to individuals worldwide. By harnessing the power of technology and evidence-based therapeutic techniques, the chatbot represents a significant advancement in addressing the growing burden of mental illness and promoting psychological well-being on a global scale.

VI. CONCLUSION

REFERENCES

In conclusion, the development and implementation of the mental AI chatbot represent a significant step forward in addressing the global mental health crisis. By leveraging Conversational AI and Cognitive Behavioral Therapy techniques, the chatbot provides accessible, personalized, and effective support to individuals in need. Through its ability to categorize users, offer tailored counselling interventions, and facilitate continuous guidance and support, the chatbot offers a scalable solution to improve mental health outcomes. Moving forward, continued refinement and integration of innovative technologies will be essential to enhance the chatbot's capabilities and further expand its reach, ultimately fostering greater resilience and well-being in communities worldwide.

VII. FUTURE SCOPE

Augmented Reality (AR) and Virtual Reality (VR) technologies hold immense potential as future scope for the mental AI chatbot project. AR can augment the user's real-world environment with virtual elements, providing immersive experiences tailored to mental health interventions. For instance, AR could simulate calming environments for meditation or overlay cognitive behavioural therapy exercises onto everyday activities. On the other hand, VR can transport users to entirely virtual environments, offering immersive simulations for exposure therapy, relaxation, or stress management. By incorporating AR and VR into the chatbot platform, users can engage with mental health interventions in more immersive and interactive ways, potentially enhancing their effectiveness and engagement. Additionally, these technologies can overcome barriers to accessibility by providing virtual therapy sessions to individuals who may have difficulty accessing traditional mental health services. Overall, AR and VR have the potential to revolutionize the delivery of mental health support, offering innovative solutions for improving well-being.

- [1] Jetli Chung and Jason Teo (Faculty of Computing and Informatics, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah, Malaysia,)
Year:-2022
- [2] Mudasir Ahmad Wani, Mohammad A. ELAffendi, Kashish Ara Shakil, Ali Shariq Imran, Senior Member, IEEE
Year:- 4 August 2023
- [3] Usman Ahmed Jerry Chun-Wei Lin Senior Member, IEEE, and Gautam Srivastava
Year:- Feb 2023
- [4] Kazuhiro Shidara, Hiroki Tanaka, Rumiko Asada, Kayo Higashiyama, Hiroyoshi Adachi, Daisuke Kanayama, Yukako Sakagami, Takashi Kudo
Year:- July 15 2022
- [5] Manav Pradeep Jain Soumyaprakash Sribash Dasmohapatr, Professor Stevina Correia
Year:-2020
- [6] Muhammad Nouman, Hollian Sara, Sui Yang Khoo, MA Parvez Mahmud, Abbas Z. Kouzani, School of Engineering Deakin University Geelong, Australia
Year:- 2023
- [7] T.Thamaraimanalan, M.Mohankumar, H.Anandakumar, M. Deepha, U. Hari Priya, G. Bhanu Priya, M. Aiswarya Devi
Department of Electronics and Communication Engineering, Sri Eshwar College of Engineering
- [8] Ranjana R, T Subha , Sreenidhi K L, Akshaya K B - Department of Computational Intelligence SRM Institute of Science and Technology Chennai, India
Year:-2022
- [9] CH.M.H.Saibaba, Alekhya K V K, Yeshwanth K
Department of CSE Department of CSE Department of CSE
Koneru Lakshmaiah Education Foundation Koneru Lakshmaiah Education Foundation Koneru Lakshmaiah Education Foundation
Vaddeswaram, Guntur