

Mental Health Support Chatbot

Aman Singh (CE Student, ISBM College Of Engineering),

Priya Mourya (CE Student, ISBM College Of Engineering),

Vijay Singh (CE Student, ISBM College Of Engineering) and

Anurag Yesansure (CE Student, ISBM College Of Engineering)

Guide: - Prof. Shobha Bamane (CE Professor, ISBM College Of Engineering)

Department of Computer Engineering

ISBM College of Engineering, Pune-412115, Maharashtra, India

ABSTRACT

Mental health conditions, including stress, anxiety and depression, are on the rise in workplaces and in the workplace, often as a result of today's fast-paced, high-pressure work environments. Access to quality mental healthcare suffers from social stigma, geographic barriers, and the high costs associated with treatment, resulting in many people going without proper support. Utilizing artificial intelligence and natural language processing, this study provides a comprehensive framework for a can chatbot of little cost to patients, available around the clock and created to aid in individualize mental wellness problems.

The chatbot uses advanced machine learning algorithms to analyse user emotions, especially leveraging the power of DistilBERT and actions using OpenCV to detect face expression. The bot uses emotion detection and NLP skills and customise response as per emotional state of the user to ensure empathetic and situation appropriate conversation.

Thus, a chatbot system that is powered by past data along with facts and AI Integration can totally change the way mental health issues are looked upon by providing users with continuous, scalable, and humanized care.

Keywords: Natural Language Processing (NLP), OpenCV, Emotion Detection, AI-Powered Chatbots, DistilBERT, Text-Based Interactions, Stigma-Free Therapy, Personalized Support, Predictive Mental Health Support, and Real-Time Analytics.

INTRODUCTION

The World Health Organization (WHO) overlook the mental health as a state of overall physical, mental, and social well-being. Getting access to mental health care is still a very big yet unsolved problem worldwide, though, especially in poor countries where only 52% of them have community-based mental health programs, whereas developed countries have 97%. People often do not seek help by social problems like social stigma, lacking of good Professionals, and financial problems. Even people who have access to mental health services sometimes put them off because they are afraid of being judged or think their problems are not critical enough to need professional help.

To solve these problems, we suggest a Mental Health Support Chatbot that can be used on any electronic device which consist of internet connection to offer people anonymous, accessible, and free support at any time. In order to get user emotions and give responses that are humanly correct for their state of mind, the chatbot makes use of Natural Language Processing (NLP) algorithms. The technology also includes text-based communication along the real time facial expression analysis using OpenCV in it. This integrated feature ensures user-friendliness by removing the need for users to add additional libraries or upgrade the system.

Current chatbots those are available provide very generic and repetitive responses, which may not fulfill the needs of mental health support. In order to solve this, our chatbot uses deep learning techniques along with OpenCV facial recognition to improve its ability to understand user inputs, allowing it to provide very precise and varied responses. These features guarantee that the chatbot can handle critical emotional requirements along with being entertainer.

The goal of this project is to create a tool that guarantees everyone has access to best mental healthcare, irrespective of their social and economic background. By focusing on academic expertise with growing technology, this chatbot seeks to decrease the suffering, encourage mental health, and make the world a more caring place.

LITERATURE SURVEY

The very first stage of Chatbot development, especially those which used the knowledge of Machine Learning and Natural language Processing (NLP) was an in-depth analysis of earlier studies on the creation of Chatbots for varying fields and AI assistants for mental health support. Due to social stigma and lack of concern for the care of mental health number of studies across the world highlight the importance of chatbots and how they can improve mental health counselling by offering scalable, easily accessible help to the people in need. Vaidyam et al. (2019) underlined the scalability of chatbots in providing personalized mental health interventions stating that they can provide help and support to anyone in need [1]. Similarly, Pandey et al. (2022) showcases how NLP and the understanding of Deep Learning would help improve the chatbot's functionality, like in the creation of "Ted the Therapist", which suggests the user engagement using the chatbot system.

Sharma et al. (2018) demonstrated the high effectiveness of ML algorithms in the development of chatbots with the help of neurodevelopmental disorder analysis, stating that AI and ML algorithms can be used to provide the first interactive mental health assessments. [3]. Hoermann et al. (2017) shows hoe text- based dialogue management systems can be highly successful in providing mental health therapies to the consumers in a real-time basis [4]. As per the statement of Lalitha R et al. (2023) chatbots for mental health are very useful in providing personalized, context-aware, emotional support that aids in better management of the mental health issues [5]. Furthermore, Hornstein et al. (2024) indicates how NLP can be used to predict the human emotion and the further user interactions

in the psychological therapies, which would improve the long-term goals of the mental health support chatbot development.

Patil et al. (2022), added that ML enables chatbots to adjust to the past user experience and interactions through the session storage and thus further customizing the therapy experience for each individual according to the session storage history [7]. Even though as there is no concrete point in denying that the chatbots are proven to improve the mental healthcare assistance, some research, as of conducted by Sweeney et al. (2021), suggests that the chatbots should be used in accordance and in parallel with the human interaction rather than just being dependent on it. Brown et al. (2021) emphasize that AI should rather be used as a supplemental tool than a substitute for a human therapist. In the mental healthcare infrastructures [9]. Forouzanfar et al. (2024) mentioned that in order to enhance the user experience the significance of error correction and adaption techniques.

These reviews thus emphasize how sophisticated NLP models are in the mental health chatbot development.

METHODOLOGY

This methodology involved a multi-step approach within the study that incorporated multiple approaches and strategies: feature engineering, model building, data simulation, research design, data collection, and evaluation. Using a mixed-methods approach, this study combines both qualitative and quantitative data collection and analysis methods to ensure a comprehensive understanding of the factors influencing chatbots interactions and mental health. To provide better insights, the study's approach examines the user data, interaction log along with past history dataset. To obtain a context-based understanding of the chatbot's capabilities, mental health illnesses, and the challenges of mental healthcare, the component which focuses on the quality of content, on the other hand, is totally based on case studies and expert interviews. To provide the guarantee that the mental health assistant offers professional advice and emotional support, the system design merges AI technology with practical components for user engagement and involvement. The steps to complete the solution are as follows:

1. Types of Users and Their Features:

The chatbot system provides the solution to a wide range of users, each with unique usage habits.

Patients or People Seeking Help: These are people who may be struggling with mental health conditions like depression, anxiety, or stress. They could want that's formed in response to need in a fleeting way without direct support or access to clinical psychologists. Hence, they are typically non-technical users, and need a simple to use interface that can offer guidance, advice, and emotional support. People's emotional disbalances affects their interaction with the system, emotional disbalances can state anything from little discomfort to harsh mental health crises. They engage with the chatbot to reflect on their feelings, seek emotional advice, and utilize the camera's emotion detection function to analyse their current mental state.

Mental Health Professionals (Psychiatrists or Therapists): These are the people who are professionals in the mental health field, such as psychiatrists or therapists, who offer therapy or consultations charging some fee. To communicate with the current system, they update their profiles for patients who ask for their help, which provides their availability and contact details. For interacting with people who are in need of support, they might also use the platform to evaluate patient inquiries and to provide consultation details.

2. Assumptions and Dependencies:

This study has used a strategy that combines a number of different approaches and strategies, which includes feature extraction and engineering, development of model, data simulation, research development, collection of data, and overall evaluation. The study uses a combination of various methods, integrating quality insights and quantitative data analysis to full proof a thorough and concise summary of the variables that are affecting interactions with chatbot and issues related to mental health. In order to obtain rightful evidence, the quantitative component analyzes user data, interaction logs, and historical mental health datasets. Similarly on the other hand, the qualitative component uses various case studies and interviews of experts to obtain context-based knowledge about chatbot capabilities and mental health issues.

3. Functional Requirements:

System Feature 1: Chatbot for Mental Health Support The chatbot is system's main component, it is made to provide users with support they need to balance their emotions along with recommendations. The main problems related to mental health are stress, anxiety, depression, or general emotional distress which are identified by processing the user's input. The chatbot creates the responses with very personalized, human based responses based on these inputs, such as articles about self-help, various breathing techniques, or reassurance. When users still show some critical issues, such self-harm or huge anxiety, the chatbot will solemnly identify it and will try to provide information on nearby local psychiatrists to encourage users to get professional assistance along with providing assurance. In order to guarantee that responses change over time and give users more personalized recommendations, the system will keep track of previous conversations. The chatbot will be accessible around-the-clock, guaranteeing users dependable and constant assistance.

System Feature 2: Emotion Detection via Camera The feature of the chatbot uses the electronic device camera to have a look at users' facial expressions and understand the condition of user. It can easily identify emotions like happiness, sadness, anger, or worry and provide the responses. If the chatbot senses stress or anxiety, it can suggest various relaxation methods or connect users with a mental health assistant. To help users notice their emotional patterns and find recurring problems, it keeps a log of their feelings over time. Importantly, the system won't save any photos or videos to protect user privacy, and users can easily turn this feature on or off whenever they want.

System Feature 3: Nearby Psychiatrist Recommendations This nearby psychiatrist's search feature makes it very easy for the users to find professional help by recommending therapists or psychiatrists based on where they are. Using the Justdial API, the system looks for nearby mental health experts, but only with the user's consent. To help the users see where these professionals are currently located, the results show up on the map. If the chatbot realizes that online help isn't good enough and the user is still showing high symptoms then this feature allows users to connect with in-person support.

System Feature 4: Stress Assessment through Interaction In addition to recognizing faces, this technology can also gauge how stressed a user is based on their chats with the chatbot. It will look at the user's words to spot signs of stress, irritation, or concern. If it detects high stress, the chatbot will quickly share tips for managing it, like ideas for journaling or mindfulness practices. To get a fuller view of the user's mental well-being, the system will combine the results from analyzing the conversation and recognizing emotions. If both areas indicate a lot of stress, the system will prioritize professional help.

4. External Interface Requirements:

User Interfaces: The user interface should be designed to be intuitive, simple to operate and user friendly especially for the users in the extreme need of mental health care and support suffering through stress and anxiety. One of the most major interface elements is a easy to use chatbot where the end users can have an interactive text-based session. The real-time emotion of the user will be detected using the camera-based emotion detection using OpenCV (camera vision). Further, more the interface features also include an easy to use and an interactive analytical dashboard for starting the conversation using the chatbot and finding the local psychiatrist.

Hardware Interfaces: The chatbot system requires use of camera to detect the real-time emotions of the end-users. The emotion recognition ability depends on a functional camera on the device users have.

Software Interfaces: The chatbot system should combine all the software modules and the APIs efficiently. OpenCV would access the live camera feeds to recognize the users emotions according to facial expressions, using the data about the local psychiatrists will be retrieved using Goggle Maps API.

5. System Requirements:

Database Requirements: MongoDB, a NoSQL database, will be used by the system because of its adaptability to unstructured data, including chatbot chats. In order to protect user privacy, it will only keep the bare minimum of data, such as session information and chatbot history. A firewall will prevent direct access to the database server, and the system will guarantee that access is authenticated and database transactions are encrypted.

Software Requirements: For scalability, the solution will work with cloud platforms like AWS or Azure in addition to Windows and Linux systems. React will be used for the frontend to build an interactive user experience, while Node.js and Express will be utilized for the backend to handle server requests. Additionally, the system will interface with external APIs like Hugging Face for NLP-based chatbot responses and OpenCV for emotion recognition.

Hardware Requirements: A multi-core processor, at least 4GB of RAM, and at least 1GB of SSD storage for logs and temporary data are necessary for the system server. In order to manage real-time interactions, the server needs have sufficient network bandwidth. Smartphones, tablets, and desktop computers with working cameras for emotion recognition are among the devices with standard hardware that consumers can utilize the system on.

6. Analysis Models:

The Agile Software Development Life Cycle (SDLC) approach will be applied to the creation of the mental health chatbot. Because the project is dynamic, the Agile technique encourages iterative development, which enables regular modifications based on product requirements and user input. There will be several stages to the development process:

Requirement gathering: Getting specific requirements from interested and important parties.

Design and Prototyping: Developing prototypes for important features and the system architecture.

Development Phase: Iteratively, small functional components are built and tested during the development phase (sprints).

Phase of testing: Verifies that every feature, including security and accuracy, operates as intended.

Deployment: Implements the system for scalability and real-time use. **Maintenance and Feedback:** Based on user input and testing, the system is continuously improved.

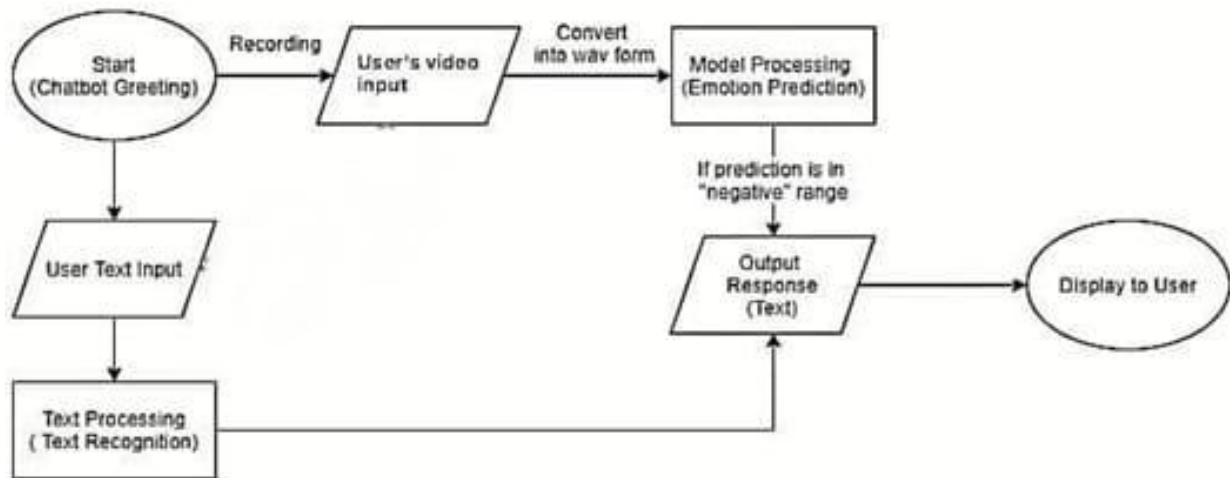


Figure: Flow of proposed mental healthcare Chatbot

FUTURE SCOPE

In future there is need to incorporate more and more datasets. This will help the suggested chatbot to be more responsive and comprehensive, and you will feel like you are interacting with a human. Also, the system can evolve through continuous extraction of feedback, learning to provide more personalized and relevant solutions. It can also help in content and functionality of the chatbots with the collaboration of human counsellors or mental health specialists. By collaborating with healthcare experts, the chatbot could refine its responses to align more closely with professional standards of care, ultimately delivering a higher-quality counselling experience.

Furthermore, the chatbot could be further accelerated by using sophisticated facial expression detection for emotion identification. In a similar way to spoken emotion recognition, face recognition uses a user's facial expressions to identify their emotional state, allowing the chatbot to spring to life with an appropriate response. Combining the audio and visual analysis of the data, the chatbot will learn specific knowledge about the emotional and psychological state of the user. The system will be better able to get the user's emotional state and respond with more sympathetic, context-related responses with the help to this dual recognition technique, which will make the experience of users seeking help more promising and encouraging.

CONCLUSION

The mental healthcare chatbot's main objective is to provide easily accessible mental health services with the help of voice and text-based counseling. This gives free and 24*7 mental health support, especially for people who find it very difficult to get their hands on traditional services because of financial or geographic limitations.

The current chatbot model is functional, but there is potential room for growth with the chatbot. Training the model by making use of additional datasets will help increase the variety of replies, and hence it will improve accuracy of the prediction. Also, there is lack of rich psychological information and user responses are very unpredictable, making it hard to follow the conversation flow. The quality of the service is degraded in such cases, even if the bot can still present relevant answers if it is outside the expected flow. Emojis are used to communicate emotion and typing indicators are used to simulate human speech to improve the experience. soothing colour combinations like

blue and green, the colour design aims to maximize customers feeling comfortable and trusting of the chatbot.

In conclusion, the chatbot has well accomplished the most of its initial goals and has the scope & visioned to be further developed to increase its mental healthcare capabilities, even though it isn't flawless currently and can yet be improved.

ACKNOWLEDGMENT

We are proud to work on the "Mental Health Support Chatbot" project. We are grateful to the ISBM College of Engineering for providing us opportunities to perform ourselves and our co-ordinator, Prof. Kailash Tripathi always stood by our side in our project and advice when we needed to tackle difficult situations. We were thrilled to have the opportunity to work with you. Thank you, everyone.

REFERENCES

- [1] W. H. H. J. K. M. T. J. Vaidyam AN, "Chatbots and Conversational Agents in Mental Health: A Review of the Psychiatric," *National Institute of Health*, 2019.
- [2] S. S. S. W. Sumit Pandey, "Mental healthcare chatbot based on natural language process and deep learning approaches: Ted the therapist," *Springer*, 2022.
- [3] S. P. Srishti Sharma, "ML Algorithms that have been Utilized to Classify Neuro-Development Disorders: A Review," *MDPI*, 2018.
- [4] K. L. M. D. N. M. R. A. C. Simon Hoermann, "Application of Synchronous Text-Based Dialogue Systems in Mental Health Interventions: Systematic Review," July 2017. [Online]. Available: <https://pubmed.ncbi.nlm.nih.gov/28784594/>.
- [5] G. S. J. J. K. V. C. T. S. Mrs. Lalitha R, "Mental Health Chatbot," *International Journal of Research Publication and Reviews*, p. 76, October 2023.
- [6] J. S. K. H. U. L. R. W. Silvan Hornstein, "Predicting recurrent chat contact in a psychological intervention for the youth using natural language processing," *npi digital medicine*, 2024.
- [7] A. B. S. D. P. P. P. S. J. Prem Patil, "Mental Health Chatbot System by Using Machine Learning," *International Research Journal of Engineering and Technology (IRJET)*, May 2022.
- [8] C. P. E. E. R. B. COLM SWEENEY, "Can Chatbots Help Support a Person's Mental Health? Perceptions and Views from Mental Healthcare Professionals and Experts," *ACM Transactions on Computing for Healthcare*, 2021.
- [9] J. H. Julia E.H. Brown, "AI chatbots cannot replace human interactions in the pursuit of more inclusive mental healthcare," *ELSEVIER*, 2021.

-
- [10] S. I. a. M. Forouzanfar, "Error Correction and Adaptation in Conversational AI:," *MDPI*, 2024.
- [11] L. F. A. R. R. V. J. W. S. J. W. S. M. A. S. M. L. Z. N. Fabeha Zafar, "The Role of Artificial Intelligence in Identifying Depression and Anxiety: A Comprehensive Literature Review," *Cures*, 2024.
- [12] R. F. W. F. Hill J, "A comparison between human–human online conversations and human–chatbot conversations. Computers in Human Behavior," *Research Gate*, 2015.