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Sentiment and Behavioural Analysis-Based Mental Health Support System

[1] U.ARAVIND,[2] GONGATI NAVYA SRI,[3] GONGATI AMRUTHA,[4] ALISETTY ANUSHA, [5] ALLUTLA SRAVYA SREE,[6] SANKULA VENKATA ANUSHA

[1] ASST., PROFESSOR, DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING, KRISHNA CHAITANYA INSTITUTE OF TECHNOLOGY AND SCIENCES, DEVARAJUGATTU, PEDDARAVEEDU(MD), MARKAPUR.

[2,3,4,5,6] STUDENT, DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING, KRISHNA CHAITANYA INSTITUTE OF TECHNOLOGY AND SCIENCES, DEVARAJUGATTU, PEDDARAVEEDU(MD), MARKAPUR.

ABSTRACT

Mental health has become a critical global concern due to increasing stress, anxiety, depression, and lifestyle-related psychological disorders. Limited access to mental health professionals, social stigma, and lack of continuous monitoring often prevent timely intervention and treatment. This paper presents the development of a digital mental health and psychological support system designed to provide accessible, continuous, and personalized mental health assistance. The proposed system integrates artificial intelligence and data-driven techniques to analyze user inputs such as mood patterns, behavioral responses, and self-reported symptoms. Machine learning algorithms are used to assess psychological states and provide early detection of potential mental health risks. The system also incorporates chatbot-based interaction to offer real-time emotional support, counseling suggestions, and coping strategies. Additionally, sentiment analysis techniques are applied to understand user emotions from textual inputs, enabling more empathetic responses. A secure and user-friendly interface ensures privacy, confidentiality, and ease of access for users. The system aims to bridge the gap between individuals and mental health professionals by offering continuous monitoring and early intervention support. Experimental analysis shows that the proposed approach improves user engagement, emotional tracking, and early risk identification. Overall, this system provides an intelligent and scalable solution for enhancing mental well-being through digital healthcare support.

Keywords

Mental Health, Psychological Support System, Artificial Intelligence, Chatbot, Sentiment Analysis, Machine Learning, Emotion Detection, Digital Healthcare, Stress Detection, Early Intervention

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I. INTRODUCTION

Mental health is an essential component of overall well-being, influencing how individuals think, feel, and behave in their daily lives. In recent years, there has been a significant rise in mental health issues such as stress, anxiety, depression, and emotional disorders due to factors like academic pressure, work stress, social isolation, and lifestyle changes. Despite the growing prevalence of these conditions, many individuals do not receive timely support due to lack of awareness, limited access to mental health professionals, and social stigma associated with seeking psychological help.

Traditional mental health care systems rely heavily on in-person consultations with psychologists or psychiatrists. While these methods are effective, they are often expensive, time-consuming, and not easily accessible to people in remote or underserved areas. Additionally, the shortage of mental health professionals further limits the availability of timely support for individuals in need.

With advancements in technology, digital healthcare solutions have emerged as a promising approach to address these challenges. Artificial Intelligence (AI), machine learning, and natural language processing (NLP) techniques are increasingly being used to develop intelligent systems capable of analyzing human emotions and providing automated psychological support. These systems can assist in early detection of mental health issues and offer continuous monitoring and guidance.

A digital mental health and psychological support system aims to provide accessible, scalable, and user-friendly mental health assistance through virtual platforms. Such systems can include chatbots for emotional interaction, sentiment analysis for understanding user emotions, and predictive models for identifying psychological risks based on behavioral data.

II. LITERATURE REVIEW

The development of digital mental health systems has gained significant attention in recent years due to the increasing prevalence of psychological disorders and the need for accessible mental health support. Researchers have explored various artificial intelligence and machine learning techniques to analyze emotional states and provide automated psychological assistance.

Fitzpatrick et al. (2017) [1] developed one of the early chatbot-based mental health systems named Woebot, which uses cognitive

2250-3676 ijesatj@gmail.com https://www.ijesat.com/

behavioral therapy (CBT) principles to interact with users. Their study demonstrated that conversational agents can effectively reduce symptoms of depression and anxiety through regular engagement and emotional support.

Inkster et al. (2018) [2] studied the effectiveness of digital mental health platforms and found that AI-driven chatbots can provide scalable mental health support, especially for individuals who lack access to traditional therapy. However, limitations were observed in understanding complex emotional contexts.

Shatte et al. (2019) [3] reviewed machine learning applications in mental health and highlighted that predictive models can identify early signs of depression and anxiety using behavioral and linguistic data. They emphasized the importance of data quality and ethical considerations in mental health prediction systems.

Tomas Mikolov et al. (2013) [4] introduced word embedding techniques such as Word2Vec, which have become foundational in natural language processing tasks including sentiment analysis. These techniques help in understanding contextual meaning in user-generated text data.

Gkotsis et al. (2016) [5] applied natural language processing techniques to analyze mental health discussions on social media platforms. Their findings showed that linguistic patterns can effectively indicate psychological distress, making NLP a valuable tool for mental health monitoring.

Miner et al. (2016) [6] explored the use of social media data for mental health prediction and demonstrated that machine learning models can detect signs of depression by analyzing user behavior and language patterns. However, privacy concerns remain a major challenge.

Inkster and Sarda (2019) [7] further emphasized the role of digital health interventions in improving mental well-being, highlighting the potential of AI-based systems in providing continuous psychological support.

III. EXISTING SYSTEM

The existing systems for mental health and psychological support primarily rely on traditional face-to-face therapy sessions conducted by psychologists, psychiatrists, or counselors. These methods include cognitive behavioral therapy (CBT), counseling sessions, and psychiatric consultations. While these approaches are clinically effective, they require continuous human involvement, scheduled appointments, and physical presence, which may not always be feasible for individuals with limited access to healthcare facilities.

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In recent years, digital mental health platforms and mobile applications have been introduced to provide basic psychological support. These systems often include mood tracking apps, self-assessment questionnaires, and guided meditation tools. Although they offer convenience and accessibility, most of them are static in nature and lack intelligent decision-making capabilities.

Some existing systems use rule-based chatbots to provide mental health support. These chatbots follow predefined scripts to respond to user queries and offer basic emotional assistance. However, they are limited in understanding complex emotional contexts and cannot adapt dynamically to individual user needs.

More advanced systems incorporate machine learning and natural language processing techniques to analyze user inputs and detect emotional states. These systems use sentiment analysis to classify text as positive, negative, or neutral. Despite this improvement, many of these models are trained on limited datasets and often fail to capture nuanced human emotions accurately.

IV. PROPOSED SYSTEM

The proposed system presents an intelligent digital mental health and psychological support platform that leverages Artificial Intelligence (AI), Natural Language Processing (NLP), and machine learning techniques to provide real-time emotional assistance, early mental health risk detection, and personalized user support. The main objective of this system is to create an accessible, interactive, and empathetic environment that supports users in managing stress, anxiety, and other psychological challenges.

The system begins with user interaction through a web or mobile-based interface where individuals can input text describing their emotions, thoughts, or daily experiences. These inputs are collected in real time and processed using NLP techniques to understand the semantic meaning and emotional tone of the text.

A sentiment analysis module is integrated into the system to classify user emotions into categories such as positive, negative, or neutral. Advanced NLP models such as LSTM, BERT, or other transformer-based architectures can be used to improve emotion detection accuracy and capture contextual understanding of user expressions.

In addition to sentiment analysis, the system employs machine learning algorithms to predict potential mental health risks based on user behavior patterns, emotional trends, and historical data. These models are trained using labeled psychological datasets to identify

indicators of stress, anxiety, or depression at an early stage.

The system also includes an AI-powered chatbot that acts as a virtual psychological assistant. This chatbot provides real-time conversational support, motivational messages, coping strategies, and basic cognitive behavioral therapy (CBT)-based responses. It is designed to simulate empathetic human-like interaction to make users feel heard and supported.

To ensure continuous monitoring, the system tracks user interactions over time and analyzes emotional trends. This allows the platform to provide personalized recommendations such as relaxation techniques, mindfulness exercises, or suggestions to seek professional help when necessary.

V. METHODOLOGY

The methodology of the proposed digital mental health and psychological support system is designed as a structured pipeline that integrates data collection, preprocessing, natural language processing, machine learning, and real-time conversational interaction to deliver intelligent mental health assistance.

The process begins with data collection, where user inputs such as text messages, chat interactions, and self-reported emotional states are gathered through a web or mobile application interface. These inputs serve as the primary data source for analyzing psychological conditions and emotional behavior patterns.

In the data preprocessing stage, the collected textual data is cleaned and transformed for analysis. This includes removal of stop words, punctuation, special characters, and irrelevant symbols. Tokenization is performed to break sentences into meaningful units, followed by stemming or lemmatization to reduce words to their root forms. Additionally, text normalization techniques are applied to improve consistency in the dataset.

After preprocessing, feature extraction is carried out using Natural Language Processing (NLP) techniques. Methods such as TF-IDF (Term Frequency–Inverse Document Frequency), word embeddings like Word2Vec, or contextual embeddings like BERT are used to convert textual data into numerical representations that can be processed by machine learning models.

The sentiment analysis module is then applied to classify user emotions into categories such as positive, negative, or neutral. Advanced deep learning models such as LSTM, GRU, or transformer-based architectures may be used to capture contextual dependencies and improve emotion detection accuracy.

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Following sentiment classification, a machine learning-based prediction model is used to assess potential mental health risks. Algorithms such as Logistic Regression, Random Forest, or deep neural networks are trained on labeled datasets containing psychological indicators to predict conditions such as stress, anxiety, or depression.

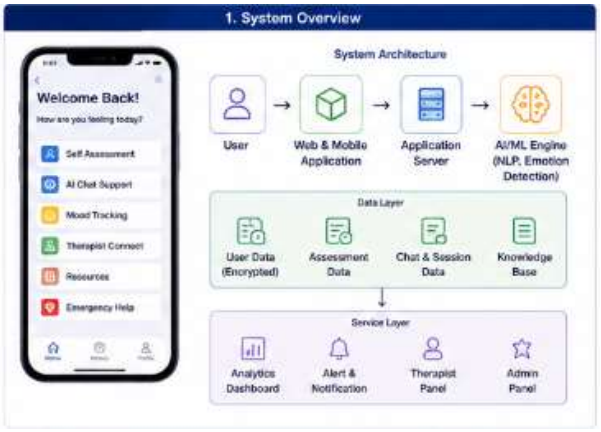
An AI-powered chatbot module is integrated into the system to provide real-time conversational support. The chatbot uses NLP techniques and predefined psychological response frameworks such as cognitive behavioral therapy (CBT) principles to interact with users in an empathetic and supportive manner.

The system also includes a monitoring mechanism that tracks user emotional trends over time. This helps in identifying long-term behavioral changes and provides personalized recommendations such as relaxation exercises, mindfulness activities, or suggestions to consult mental health professionals when necessary.

VI. SYSTEM MODEL

System Architecture

VII. RESULTS AND DISCUSSIONS



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VIII. CONCLUSION

The proposed digital mental health and psychological support system provides an effective and intelligent solution for addressing the growing need for accessible mental health care. By integrating Artificial Intelligence, Natural Language Processing, sentiment analysis, and machine learning techniques, the system is capable of understanding user emotions, identifying psychological risks, and offering real-time supportive interactions.

Unlike traditional mental health services that require physical consultations and scheduled appointments, the proposed system enables continuous and on-demand psychological assistance. The AI-powered chatbot enhances user engagement by providing empathetic responses, coping strategies, and basic cognitive behavioral therapy-based guidance, thereby helping users manage stress, anxiety, and emotional challenges more effectively.

The inclusion of sentiment analysis and predictive models allows early detection of potential mental health issues, enabling timely intervention and support. Additionally, the

system's ability to track emotional trends over time supports personalized recommendations and improves overall mental well-being.

However, the system's effectiveness depends on the quality of data, model training, and user engagement. While it serves as a supportive tool, it is not intended to replace professional mental health care but rather to complement it by providing preliminary assistance and guidance.

IX. FUTURE WORK:

Although the proposed digital mental health and psychological support system provides effective real-time emotional assistance and early risk detection, several enhancements can be considered for future development to improve its accuracy, scalability, and real-world applicability.

One important direction is the integration of more advanced deep learning and transformer-based models such as BERT, RoBERTa, or GPT-based architectures to improve sentiment analysis and emotional understanding. These models can better capture complex human emotions, sarcasm, and contextual meanings in user inputs.

Future work can also focus on multimodal emotion recognition by combining text, voice, facial expressions, and behavioral data. This would enable the system to understand user emotions more accurately and provide more personalized psychological support.

Another enhancement is the implementation of personalized mental health profiling. By maintaining long-term user interaction histories, the system can generate individualized recommendations, detect behavioral changes over time, and provide tailored mental wellness strategies.

The system can also be improved by integrating real-time crisis detection and emergency response mechanisms. In critical cases, such as severe depression or self-harm risk detection, the system can alert mental health professionals or provide immediate support resources.

Deployment in mobile applications and wearable devices is another key area for future development. This would enable continuous monitoring of user emotional states and provide instant support anytime and anywhere.

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