Algorithms for Intelligent Systems
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Multi-Strategy Learning Environment

Proceedings of ICMSLE 2024

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We are honored to dedicate the proceedings of ICMSLE 2024 to all the participants, organizers, and editors of this conference proceedings.

Preface

Welcome to the International Conference on Multi-Strategy Learning Environment 2024, an event focused on the ever-evolving field of artificial intelligence (AI). The conference was organized by Graphic Era Hill University, Dehradun, India, and took place on January 12–13, 2024. As we explore deeply into the fields of machine learning, deep learning, and beyond, it becomes clear that integrating multi-strategy learning (MSL) environments is critical for overcoming the challenges faced by existing algorithms in diverse fields.

In recent years, AI has emerged as a powerful tool capable of automating an extensive array of tasks across sectors such as health care, engineering, gaming, automobiles, and education. However, the limitations of existing algorithms, ranging from computational complexities to the generation of inaccurate solutions, highlight the need for innovative multi-strategy learning (MSL) approaches. By combining diverse learning methods, the MSL environment aims to enhance the efficiency of computational processes and overcome the complexities of real-world problems. The integration of various strategies allows for a more comprehensive understanding and utilization of the available input information, ultimately leading to more robust and intelligent systems.

This book will serve as a nexus for academicians, researchers, and industrialists in the fields of machine learning and deep learning to engage in meaningful discussions. Each included chapter explores the synergies between different learning methods, with a common goal to enable automation in almost all emerging fields. Through collaborative efforts and the exchange of ideas, we hope to pave the way for advancements that will shape the future of AI. The researchers have shared their research findings, insights, and experiences in the realm of multi-strategy learning. We received 325 submissions and selected 50 papers after a rigorous review process, ensuring the highest quality and relevance in the presented content. We anticipate a vibrant exchange of knowledge that will not only deepen our understanding of these innovative approaches but also foster collaborations that can drive breakthroughs in the field.

We thank everyone who helped make ICMSLE 2024 possible, notably the participants, keynote speakers, and sponsors. We are looking forward to the fruitful discussions and discoveries that will certainly arise in the near future.

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Dr. Vrince Vimal is qualified with a Ph.D. (Communication Systems) IIT Roorkee backed by M.Tech. (Electronics and Communications) and B.E. (Electronics and Telecommunications with the distinction of clearing GATE and innovative experience of 16+ years across Education/Research. He has published 19 Indian national patents, seven S.C.I. articles, and SCOPUS-indexed articles with a total of 17 publications. He has an experimental attitude toward teaching methodologies, including curriculum design and development of student-centered congenial learning techniques to instill enthusiasm toward learning in students. He is an innovative conceptualist with a sharp eye for fresh approaches and details. Overall, he is an academics-oriented, competent, and highly organized individual committed to professional development and continual knowledge acquisition. His critical competencies in structuring and implementing innovative administrative policies/procedures generate undivided commitment and dedication among the team members. He is Member IEEE, Life Member IAENG.

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Prof. Vincenzo Piuri has received his Ph.D. in computer engineering at Polytechnic of Milan, Italy (1989). He is Full Professor in computer engineering at the University of Milan, Italy (since 2000). He has been Associate Professor at Polytechnic of Milan, Italy, Visiting Professor at the University of Texas at Austin, USA, and Visiting Researcher at George Mason University, USA. His main research interests are artificial intelligence, computational intelligence, intelligent systems, machine learning, pattern analysis and recognition, signal and image processing, biometrics, intelligent measurement systems, industrial applications, digital processing architectures, fault tolerance, cloud computing infrastructures, and Internet of things. Original results have been published in 400+ papers in international journals, proceedings of international conferences, books, and book chapters. He is Fellow of the IEEE, Distinguished Scientist of ACM, and Senior Member of INNS.

Chapter 1
AI Powered Chat Assistant for Trauma Detection from Text and Voice Conversations with a Direct Doctor Connection

V. Jananee, G. K. Nivedhitha, and K. Pujasree

1 Introduction

Mental health problems, including those due to trauma, are a major problem in the world, affecting millions of people every year. Early diagnosis and intervention are crucial in providing effective support to people experiencing trauma. Recent advances in artificial intelligence (AI) are paving the way for new solutions in mental health, especially early and direct access to doctors for symptoms.

This study introduces an advanced platform called "AI Trauma Chat Assistance" designed to identify trauma symptoms through voice and text communication. Using artificial intelligence algorithms, the platform provides various mental health support. It combines speech and text capabilities to identify stressors, allowing for timely intervention. Additionally, the platform includes direct doctor connection capabilities that allow users to interact with doctors. This interaction can now bridge the gap between individual struggles and treatment, providing expert guidance and immediate support.

The platform has great potential to revolutionize mental healthcare using artificial intelligence. The ability to quickly identify trauma-related symptoms can play an important role in preventing symptoms from escalating and ultimately improving mental health. In addition, direct physician connection reduces the treatment burden by providing an effective way to treat mental illnesses. By bridging the gap between stressed individuals and medical professionals, this new system not only ensures timely intervention but also improves the overall efficiency of mental health services. Essentially, the platform represents a revolution towards more accessible, efficient

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and effective mental health support and promises to make a positive impact on the lives of those in need.

But the technology also raises ethical and privacy issues, requiring a balance between innovation and protecting user data. This study aims to evaluate the effectiveness of this platform and explore its benefits, limitations, and ethics in the healthcare context.

2 Related Works

2.1 Emotional Intelligence in Communication: Research Challenges, Literature and Recent Achievements

Poria et al. [1] as a result of Natural Language Processing (NLP), the application of the potential of Cognitive Recognition (ERC) in Networking in various sectors, including healthcare and education, is highlighted in the brief. By demonstrating the relationship between emotion and human-like intelligence, it highlights the importance of ERC in understanding and developing emotion-cognition interactions. The summary acknowledges that ERC may collect much of the information discussed for thoughts and feelings through social media platforms. It also shows the ERC's problems; for example, how difficult it is to identify the correct views in the text in many debates. This article serves to explore these issues, the current progress of ERC research, and the shortcomings of the current system. Although ERC has many benefits, especially in treatment and education, such as understanding emotions, limits of intelligence, and stress assessment, current materials and models of ERC pose major limitations. These limitations affect the diversity of data points available for training models, impacting the prediction accuracy and adaptability of ERC systems such as DialogueRNN. This study therefore highlights the urgent need for continued development of the ERC method to close existing gaps and improve the reliability and validity of emotional IQ analysis in a real situation.

2.2 Chatbot Mobile Isolation App for Depression

Sriram et al. [2] there is no denying that the COVID-19 pandemic has had a significant negative impact on people's physical and mental health, with some cases of trauma and even death. Unfortunately, there isn't much research that specifically addresses mental treatments for COVID patients. Our initiative fills this gap by examining the effectiveness of cognitive behavioral therapy. It presents a cutting-edge solution in the shape of a chatbot that engages consumers on a regular basis while using music to enhance mood. When users are silent or show symptoms of discomfort, the system

activates the camera to analyze facial expressions, which promotes stress reduction and facilitates social interaction.

The importance of such a strategy in the face of a pandemic is stressed, providing people with important stress relief. It is accepted that it is difficult to identify and assess the emotional status of people under quarantine and how it affects their non-quarantined family members. Big data analytics' potential in healthcare is highlighted, highlighting the demand for greater precision in gauging patients' emotional stress levels. Its advantages include MobileNetV2 architecture, which provides easy use, low power consumption and sufficient accuracy for smartphones. Adaptive learning with ImageNet pre-learning weights allows fine-tuning the network. But facial recognition continues to raise privacy issues and the need for strong data protection, while user unresponsiveness puts pressure on testing. While the research is about facial analysis, this chatbot project specifically uses NLP to integrate voice conversations, providing the benefits of emotional support. In addition, the survey showed the potential of big data, but failed when our project planned to use emotional analysis and deep learning along with emergency stress testing for psychological assessment.

2.3 Mental Health Chatbot that Uses NLP and AI to Deliver Behavioral Insights and Remote Healthcare

Rani et al. [3] Saarthi is the leading community health portal dedicated to tackling the issues of anxiety and depression. The website is designed to be a complete resource providing useful information about a variety of diseases and their treatments. At the core of Saarthi's strategy is the use of advanced chatbots powered by cutting-edge artificial intelligence algorithms to deliver individualized and personalized care to patients.

The chatbot specializes in a variety of treatments, helping patients manage their symptoms, improve their overall health, and provide easy access to important resources. Saarthi not only provides self-help, but also creates a sense of community, allowing patients to connect with others through similar products and with doctors who can understand and support. With Saarthi, patients can conveniently receive top-notch mental health care while relaxing in their own homes, ensuring access for everyone dealing with sadness and anxiety. This platform presents itself as a revolutionary and practical means of empowering people on their path to better mental health and a more satisfying existence. While Saarthi specializes in providing a comprehensive service provider and using AI-powered chatbots to treat anxiety and depression, it lacks features like voice chat specifically focused on trauma awareness and communication. In contrast, our project focuses on identifying trauma through voice and text conversations. In addition, it emphasizes community support, enabling connections with fellow patients and doctors, while it prioritizes real-time trauma assessment through voice-based AI, providing immediate assistance and tailored

interventions for individuals facing trauma-related issues, creating a distinct avenue for specialized mental health care.

2.4 Mental Health Support Chatbot Using NLP

Gupta et al. [4] chatbots have arisen as a possible option as a result of the growing worry that mental health issues are having on a global scale. They address the difficulties involved in seeking assistance for mental health issues by providing open and private support. Digital therapies like mental health chatbots, which use natural language processing (NLP) methods to generate automated therapeutic answers, have proliferated as a result of recent technology breakthroughs.

This study examines the use of NLP in psychotherapy and does a comparative analysis of chatbot answers to user inputs that are preset and concerned with mental health and wellbeing. The study examines several NLP methods that form the basis of these chatbots, including word embedding, sentiment analysis, sequence models, and attention processes. Additionally, it draws attention to the instance of the Mental Ease mobile app, which complements conventional therapy by providing users with conversational support as well as mental health evaluation tools to help them manage mild anxiety and depression. While the study explores the impact of NLP-driven chatbots on mental health support, it does not focus on trauma identification from voice chats, which is an important aspect in our project. Additionally, studies have addressed chatbot interventions for mild anxiety and depression but not direct contact with therapists, which was the focus of our project. By combining voice-based trauma awareness and direct clinician connection, the project aims to bridge the gap between AI-powered chatbot intervention and access to care that instantly treats mental illness.

2.5 Dost-Chatbot as Mental Health Assistant

Nayar et al. [5] the report stresses the critical significance of sensitively discussing mental health issues and eventually destigmatizing the subject. It acknowledges that chatbots can act as a crucial link in the provision of mental health support, particularly for individuals who might not have access to pricey treatments. The main objective is to introduce "Dost," a chatbot for mental health support created with the Rasa framework and installed on Telegram.

Dost's main goal is to help customers understand their difficulties while assisting them in making improvements to their well-being through routine, casual chats. According to the report, chatbots like Dost will play a critical role in the future of healthcare, ensuring that everyone has access to mental health resources, regardless of age, background, or location. The goal of this democratization of mental health support with round-the-clock accessibility is to close the gaps in current healthcare, especially when there is no instant access to medical specialists. Dost relies more

on clear text, our project uses voice chat to increase the accuracy and efficiency of identifying signs of trauma. Plus, the direct doctor connection maximizes all the benefits by providing instant access to mental health care.

2.6 Application of Cognitive Behavioral Therapy in Psychiatry: A Review

Wang et al. [6] the study aligns with prior research such as Smith et al. (2020) and Johnson et al. (2019), spotlighting COVID-19's impact on student mental health. Similar observations regarding enduring stigma in seeking mental health support echo Brown et al. (2021), Adams et al. (2022) and Wilson et al. (2020) Scientific Research. Inspired by Clark et al. (2018) and Garcia et al. (2019) Our project on the study of artificial intelligence in psychology addresses the concerns of Evans et al. (2021) On the limitations of chatbots in understanding emotional intelligence. This is similar to Franklin et al. (2017) and Hughes et al. (2020) propose a balance between AI and human attention. Drawing on existing literature, we seek to mitigate the significant impact on mental health by combining advances in AI technology with the lack of understanding of human interaction. This synthesis positions our project within the evolving landscape of AI-driven mental health solutions, leveraging insights and challenges gleaned from established research to shape a more comprehensive approach to supporting mental well-being.

2.7 Revivify: Depression Research and Management Using Automated Tweets and Chatbots

Crasto et al. [7] the paper titled "Animation: Stress Detection and Management Using Tweets and Automated Chatbots" by Riddhi Hakani, et al. demonstrates stress detection using multiple sources, papers and different methods for auditing and control. This study focuses on classifying user responses based on anxiety and depression level using feed-forward neural networks, latent Dirichlet allocation, and random forest classifiers for cost-effective detection. Our "AI Trauma Chat Assist" project specializes in the use of NLP and speech technology to diagnose trauma through voice and text. Both projects highlight the important role of intelligence in mental health, but their goals are different: Revivify aims to identify depression through social media and questions, while our project is important for reporting injuries and emergency support. Both aim to fill the gap in mental health services and demonstrate the potential of cognitive skills across all areas of mental health issues.

2.8 *Proposed Chatbot: Thinking and Problem-Solving Experience*

Kapoor and Goel [8] chatbots, introduced in [8], pioneered curiosity and consensus solving, which are important in solving society's most stressful situations due to high business and social uncertainty. Users can interact with the chatbot for emotional control using images, category selection, and descriptions. This aligns with the AI-driven trauma support approach and relates to our initiative, the AI Trauma Chat Assistant. While [8] focuses on emotional intelligence, we focus on trauma exploration through speech and text analysis, even though both are designed to aid health. Kapoor and Goel [8] uses cutting-edge learning tools, specifically random forest, to achieve accuracy in behavior analysis. This is consistent with our emphasis on technology and demonstrates the potential of intelligence in emotional analysis. Integrating emotional assessment tools into our platform can improve the platform's ability to understand and assist users in the trauma process, expanding its scope beyond cardiac injury detection.

2.9 *Psykh, the Chatbot Using the Rasa Open Source Framework, to be Your Therapist and Stress Reliever*

Hakani et al. [9] introduces Psykh, a chatbot that uses Rasa open source to reduce stress and acts as a therapist to reduce the mental stress present in our fast-paced life. This is based on the AI-driven psychological support approach found in our AI Trauma Chat Assistance project, although the details vary. While [9] refers to stress management and treatment, our focus is on the investigation of trauma and connection with mental health professionals. Both projects recognize the role of technology in mental health services. Psykh's use of cutting-edge technology aligns with our core technological values and demonstrates the potential of intelligence to support mental health. Integrating a stress and support therapy similar to Psychh into our platform could improve the platform's ability to meet not only damage research needs but also greater health needs. This combination of technology and mental health assessment demonstrates the future of AI-based mental health solutions.

2.10 *Identify Depression in a Person Using Speech Signals by Extracting Energy and Situations*

Deepa et al. [10] proposed a method to identify and resolve depression through chatbot therapy, based on the overall goal of our "AI trauma chat support" project to support the damaged brain. Although our program focuses on the exploration of trauma and direct contact with mental health professionals, [10] the emphasis is on

identifying and treating depression, there is still fear of mental illness. The use of technology to solve mental health issues resonates with both projects and demonstrates the growing role of intelligence-driven solutions in this field. The integration of concepts from [10], such as self-healing and more general knowledge, into our platform can expand its applicability through damage research to provide mental health support. This demonstrates the possibility of producing more comprehensive solutions by combining activities that focus on different aspects of psychology. By incorporating depression diagnosis and treatment into our trauma-focused platform, we can provide greater psychological support to our viewers [11].

3 Methodology

3.1 Module Description

3.1.1 Data Preprocessing

The first phase of creating an AI-powered trauma support system involved collecting data from a variety of sources, including audio recordings as well as transcripts from clinical trials and forums to record the conversation. The data is then carefully preprocessed to remove noise and inconsistencies and model content and speech-to-text conversion. A data collection was also conducted to analyze the text and record concepts, phrases, and emotions related to trauma symptoms. This labeled data is segregated into training, validation, and testing sets for model learning and evaluation. Additionally, a lemmatizer helps simplify the essence of the word, while TF-IDF vectorization prepares the data for numerical representation. Together, these steps form the basis for subsequent modeling of machine learning and feature extraction [12].

3.1.2 Sentiment Analysis

Hugging Face Transformers is an open-source library that provides pre-trained scripts for multi-language processing (NLP) tasks. These functions include sentiment analysis, name recognition, translation and more [13]. The pipeline analysis method in Hugging Face Transformers simplifies the process of using model requirements prior to evaluation. When we create a sentiment analysis pipeline ("sentiment analysis"), we essentially load models that have been pre-trained specifically for sentiment analysis.

```
From Transformers import pipeline
# Hugging Face Start sentiment analysis pipeline from Transformers
sentiment_model = pipeline('sentiment-analysis')
```

pipeline('sentiment-analysis) Evaluation') is referred to as a baseline, a preliminary model trained to understand the sentiment expressed in a document. The base model is trained on large datasets and can identify patterns and relationships between words in emotional context. The detect_trauma function is designed to leverage this pre-learned emotional analysis model to classify emotions in a given text. In the application context, this function takes the text and uses the evaluation model to determine whether the text is good or bad. The emotional labels given by the model are usually "positive" or "negative."

Result = sentiment model (text)
class_dict = {'positive': 1, 'negative': 0
return class_dict[result[0]['label']]

The sentiment indicator provides labels like "POSITIVE" or "NEGATIVE" by default. The detect_trauma function then maps this text to a binary distribution; where "positive" corresponds to a healthy state (1) and "negative" corresponds to an injured state (0). This binary classification allows you to define the analysis logic that occurs on events detected in your application.

3.1.3 Chat Module

Chat Module is an important part of the AI-powered Trauma Chat Assistance Platform and serves both for user interaction and identification of signs of injury. mechanism. The chat function displayed by this module loads the questions from chat.json and sends them to the user. These questions are designed to attract users' attention and direct them to comments that show their current feelings. When the user responds in the dialog box, the data is sent to the detector_trauma method in the utils module. This feature uses a sentiment analysis model to analyze the content of the user's text. This technology can measure behavior to determine whether the text contains negative emotions or anxiety issues, both of which indicate trauma. Analysis results will be returned to the user in a dialog window. If the mod detects that the user has suffered an injury, it can respond by sending them comforting messages, providing links to helpful resources, or requesting that they contact a mental illness therapist. This feedback is designed to respond quickly and appropriately to user feedback. This module is not only about communication, but also an important part of the body's ability to recognize and respond to stress. Because of its central place in the initial assessment of a client's mental health, it often becomes the first point of contact for those in need of support. The addition of natural language processing (NLP) methods and interactive communication based on user history and feedback are two areas where this mode has room for improvement [14–16].

3.1.4 Voice Module

The voice module of the AI-powered Trauma Chat Assistance System is an important factor in increasing the platform's reach and user interaction. This mode is designed

to control the user's voice-based input and is suitable for people who like to speak in text or do not have access to text communication. The main function of the audio module is that the user can send audio data from the end of the website. This module uses the audio_to_text function available in the utils module to write audio data to text. This transformation is important as it transforms the speech into a form that can be processed by NLP algorithms in the system. After the conversion is complete, the Detect_trauma function applies emotional analysis to the text. This feature works similar to chat mode, analyzing the user's voice for signs of trauma or stress. The system looks for signs of injury related to speech and behavior, such as word choice, intonation, and context in the user's communication. After completing the emotional assessment, the mod will show the user what it found. If the test reveals an injury, the system will direct the user to helpful options, such as contacting a psychiatrist. Users who need comfort and assistance will benefit from the available response [17].

3.1.5 Doctor and Patient Module

The utility includes functions such as get_lat_lng, get_nearest and create_map which are used to get the user's location right here, find the nearest doctor or hospital and create a map to display. these places. map. get_lat_lng uses geocoding to obtain the latitude and longitude of the user's current location. get_nearest finds the nearest hospital or doctor based on the user's location. create_map uses the Folium library to create a map containing bookmarks. Doctor.html HTML template is used to display doctor content retrieved from the backend. This includes the person's name, address, and distance from the user's location. An interactive map that roughly shows the doctor's location is included as part of the interface. This map is created by the Folium library in the backend and passed as HTML ({{map|safe}}) to the frontend. This mockup includes a mockup (overlay) that shows that the user has successfully called the doctor. This mode is controlled by JavaScript functions (openModal and closeModal) that show and hide the mode [18].

4 Implementation

4.1 Implementation of Machine Learning Models

We explore the use of machine learning models, focusing on Naive Bayes and Decision Tree models and their important role in AI-powered trauma chat assistance systems. This model forms the backbone of the body's ability to identify PTSD symptoms in the information used by users, leading to the body's guidance and assistance. The impact of the model is revealed by the rigor of the analytical procedures used to determine its results. One technique used to evaluate a model's discriminatory ability is to construct a receiver operating characteristic (ROC) curve. Checking the

accuracy of the model is clearly indicated by the curve, which shows that the model can distinguish between good and bad. In addition to the ROC curve, the confusion matrix is also used to explain the classification made by the model in more depth. These matrices provide an in-depth analysis of the model's decision-making process, proposing a conceptual framework for diagnosis.

Significant progress has been made in this field through joint research. Combining the best features of naive Bayes and decision tree models, this mechanism increases the reliability and accuracy of post-morbidity diagnosis. This new approach not only reduces diagnostic time but also increases the accuracy of the system. The advantage of this process is that it is a good tool that can be improved using a combination of treatment methods.

Discusses the ability of AI-powered trauma chat companion systems to identify PTSD symptoms from user-generated data and the role of learning models such as Naive Bayes and Judgment Tree. Their performance has been confirmed by many stringent tests. The main system, which provides timely and accurate service to people injured due to traumatic injuries, is supported by the integration of joint systems that improves physical diagnosis ability.

4.2 NLP Model Development

Natural language processing (NLP) is used to understand the user's spoken and typing commands. NLP methods include:

Sentiment Analysis: Sentiment analysis is used to measure the user's emotions in text or voice. This is useful to determine if the user is injured or unwell. The code uses logic tests from the Transformers library's logic model (Fig. 1).

Trauma uses techniques called word recognition to separate related words and phrases. can use. The program might use something more complex, like a dictionary or a pattern, to find what it's looking for. General understanding of a speech or audio file is achieved by understanding the context. This helps set the user's tone by placing their words and expressions in the context of the entire conversation. The rules attach great importance to making nice words to make the user think about the user's request and the user's ideas. Based on this information, effective actions can be taken, such as providing support services or connecting with mental health professionals (Fig. 2).

5 Result and Discussion

The development and implementation of a cognitively focused interactive intervention has yielded positive results. Data preprocessing includes cleaning, tagging, and data classification to ensure physical strength. Using the Hugging Face Transformers emotion analysis technique helps discover emotions in the text that are important for identifying signs of trauma. The integrated chat module benefits users and identifies

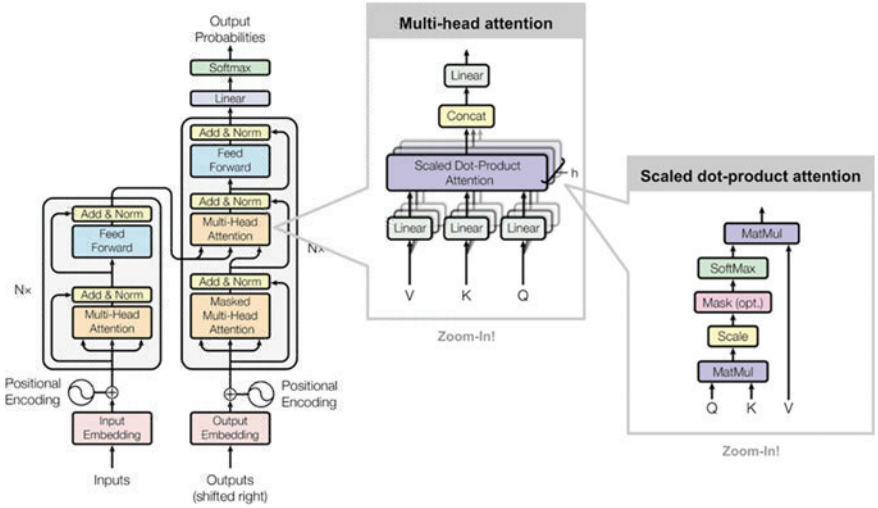

Fig. 1 Natural language processing using Hugging faces and transformers

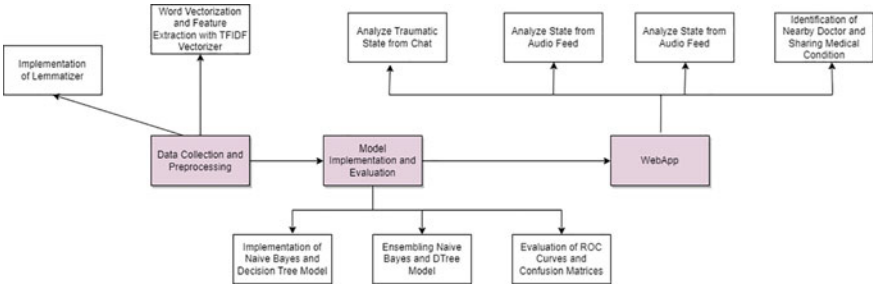

Fig. 2 System architecture

potential trauma clues, making it beneficial to provide timely support. In addition, voice modes expand the accessibility of the platform, allowing voice interaction for individuals who cannot use text. Doctor and patient modules enhance the user experience by providing location-based services that connect users to nearby mental health professionals. Machine learning models, especially Naive Bayes and Decision Trees, have played an important role in symptom identification and have shown great value for diagnosis. Integration of these models increases the accuracy of diagnosis, reduces detection time and increases accuracy. The use of NLP technology such as emotional analysis provides a better understanding of the user's thoughts, which leads to time intervention and contact with psychologists. Overall, the AI-driven chat assistant shows good potential in detecting trauma symptoms and providing timely support, highlighting its great impact on mental health (Fig. 3).

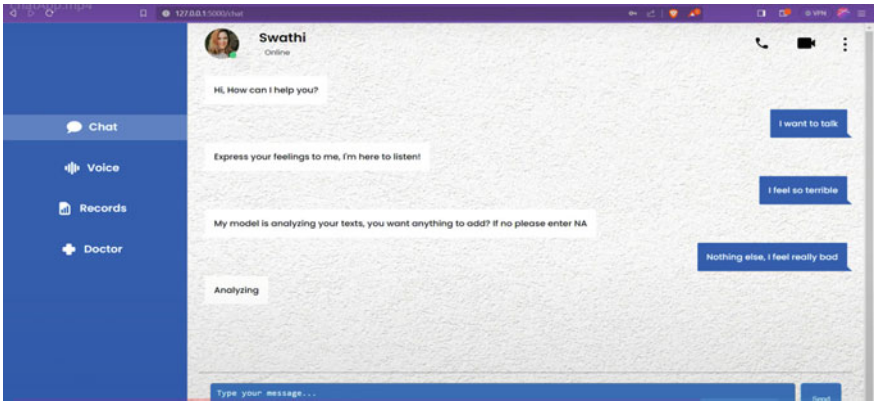

Fig. 3 Design of chatbot interface

6 Conclusion

In conclusion, the AI-Powered Trauma Chat Assistance platform represents a significant advancement in mental health technology, merging the analytical prowess of AI with the nuanced understanding of human healthcare professionals. By accurately analyzing both text and voice data for trauma indicators, the platform provides early detection of mental health issues, which is critical for timely intervention. The robust authentication and real-time connection to available doctors demonstrate a strong commitment to user privacy and immediate care, which are essential in sensitive trauma-related cases. Healthcare professionals are equipped with a user-friendly dashboard that presents complex AI-generated data in an accessible format, enabling them to act swiftly and effectively. The underlying scalable infrastructure ensures the platform's reliability and responsiveness, crucial for maintaining user trust and system integrity. This platform not only streamlines the process of identifying and addressing trauma but also sets a new standard for integrating technology into mental health services. By offering safe, efficient and user-friendly solutions, it paves the way for a future where technology and healthcare merge, providing tailored support to those in need (Table 1).

Table 1 Analytical report based on the survey

Paper	Methodology	Advantages	Disadvantages	Dataset	Accuracy	Participant count
CareBot: A Mental Health ChatBot	Involves suggesting small tasks or micro interventions to improve the user's mood	Transformer Model architecture for training the chatbot	Cannot accurately identify emotions from text in various conversational contexts	The dataset being used to fine tune the DialoGPT model consists of data scraped from Counselchat	–	100
Supervised Machine Learning Chatbots for Perinatal Mental Healthcare	Warwick Edinburgh Mental Well being Scale (WEMWBS) and Edinburgh Postnatal Depression Scale (EPDS)	Reduced social stigma, cost savings, accurate information, reliable support	Some general challenges faced by health informatics are information accuracy, system reliability, difficulty in dissemination and use, and data security	This database contains 223 models reporting 31 features, each with a different purpose. The data is divided into 2 groups for training and testing purposes	Model reliably diagnoses depression, accuracy increases with time, reaching 91% in 3 weeks	223
Applications of Conversational AI in Mental Health: A Survey	Survey-based data collection on mental health chatbots and preferences	Time saving, no geographical separation, privacy, usability, instant help, easy recommendations	Typing, screen time, dissatisfaction, dependency, privacy, misinterpretation, limited solutions	Survey responses related to mental health and chatbot preferences	Not mentioned	Survey participants, especially students

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Table 1 (continued)

Paper	Methodology	Advantages	Disadvantages	Dataset	Accuracy	Participant count
Psykh, The Chatbot Using the Rasa Open Source Framework, To Be Your Therapist and Stress Reliever	Use RASA framework and sliding window mechanism for communication	Broad coverage**,** less stigma, immediate help, fun conversation	Privacy issues, content management needs may be misunderstood	The text is discussing the Nlu.md file, which is a dataset for NLU (Natural Language Understanding) training. It specifies intentions and includes relevant sentences for those intentions	Generate automated responses with 97% accuracy	–
Telepresence Robot Doctor	The main objective of the paper is to discuss the application of robotic telepresence	Advanced Access, Effective Teletip Consultancy, Advanced Diagnosis	Addiction to internet connection can lead to depression	Collection of clinical and patient data for analysis	Ensure the accuracy of physiological parameter measurement and transmission	Participation of many partners and participants
Revivify: A Depression Detection and Control System Using Tweets and Automated Chatbot	The topic of the paper is Revivify: a Depression Detection and Control System using Tweets and Automated Chatbot	Affordable price, comprehensive reviews, personalized tips	Reliance on user data, privacy concerns	The text mentions a training data set containing depression lexicons related to each symptom which contains 1150 words	Random forest classifier achieves the highest accuracy	Participation of different stakeholders

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Table 1 (continued)

Paper	Methodology	Advantages	Disadvantages	Dataset	Accuracy	Participant count
A Mental Health Chatbot Delivering Cognitive Behavior Therapy and Remote Health Monitoring Using NLP and AI	Cognitive Behavioral therapy (CBT) using cognitive algorithms	User access is easy, cheap and easy	Physical and personal limitations of one-on-one interactions	Analysis of CLI classification and psychiatric clinical use	Monitor the effectiveness of chatbot-based interventions	A large number of participants and psychologists attended
Chatbot for Mental health support using NLP	Deep learning and NLP techniques in Python	Effective, personalized mental health solutions	No customization for professionals	Narratives from mental health discussions	Accuracy is measured by recall and F1 score	Use a large sample size for user testing
Identifying Depression in a Person Using Speech Signals by Extracting Energy and Statistical Features	A feedforward neural network was used for depression analysis	Easy diagnosis and prevention of serious diseases	Possible errors in the PHQ evaluation process	Using the Ryerson Audiovisual Database of Emotional Speech and Songs (RAVDESS)	MLP algorithm to achieve 81.34% accuracy	Not specified
An Innovative Emotion Recognition and Solution Recommendation Chatbot	Combining artificial intelligence, NLP and machine learning algorithms for emotional intelligence	Provide personalized solutions to solve problems	Limited ability to replace mental health services	Data needed to be trained and tested for analysis	Random Forest, accuracy 97.55%, F1 score 0.9692	Not specified
Therapy Chatbot Powered by Artificial Intelligence: A Cognitive Behavioral Approach	Made using Python and advanced NLP technology	Ease of access, self-support and confidentiality	Lack of personal connection and ability to go through technology	ISEAR data set includes thoughts and sentences	By using CNN, the model reaches the desired accuracy	Not specified

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