Chatbot Based On Human Depression Diagnosis System Using Symptomatic Neural Network And Nlp

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Abstract- *Depression is a common and serious medical condition that negatively affects how a person feels, thinks, and handles daily activities. It's not simply a passing mood but a persistent state of low mood and aversion to activity that can interfere with a person's daily life.Depression is a complex mental health disorder with diverse manifestations, and its accurate diagnosis and classification present significant challenges. Existing methods often rely on subjective assessments and may lack precision in predicting specific depression types and assessing symptom severity. Additionally, the provision of personalized diagnosis recommendations is limited, hindering the development of targeted treatment plans. The project addresses the critical need for accurate and personalized depression prediction and diagnosis recommendation. Leveraging advanced AI Chat-Bot and deep-learning techniques, specifically the Symptomatic Neural Network architecture and Natural Language Processing, the project aims to integrate diverse data modalities, including physiological and behavioural symptom data. The key objectives include developing a predictive model capable of accurately classifying different depression types, assessing symptom severity, and providing individualized diagnosis recommendations. The utilization of SNN-NLP enables the capture of temporal dependencies within the data, enhancing the model's ability to recognize evolving patterns over time. The project emphasizes transparency, user-centric design, and ethical considerations in handling sensitive data. Ultimately, the envisioned system aspires to contribute to the advancement of precision mental health care, offering a novel approach to depression prediction and personalized diagnosis recommendations.*

I. INTRODUCTION

Mental health disorders, such as depression, anxiety, schizophrenia, and others, affect millions of people worldwide. These conditions often involve complex patterns and symptoms, making diagnosis and treatment challenging. Mental health includes our emotional, psychological, and social well-being. It affects how we think, feel, and act. It also helps determine how we handle stress, relate to others, and make choices. Deep learning, a subset of artificial intelligence (AI), has rapidly evolved and found applications in various domains, including healthcare. Deep learning models can analyse vast datasets of physiological, behavioural, and self-reported patient information to detect early signs of mental health conditions. Deep learning offers a transformative opportunity to enhance the detection, treatment, and management of mental health conditions, ultimately improving the well-being of individuals and communities Deep learning can create predictive models that forecast an individual's risk of developing mental health disorders or the likelihood of symptom exacerbation.

II. MOTIVATION

The motivation behind creating a depression prediction system lies in the urgent need to address mental health challenges more effectively. Depression affects millions globally, yet often goes undetected or untreated due to stigma and limited access to resources. By developing such a system, the aim is to detect early signs of depression, enabling timely intervention and support. This approach enhances accessibility to mental health screening, especially for remote or underserved communities. Moreover, it streamlines the screening process, efficiently identifying at-risk individuals. Personalized interventions can then be tailored based on individual risk factors, optimizing treatment outcomes. By integrating depression screening into routine healthcare practices and leveraging technology, the system aims to destigmatize mental health discussions and encourage help-seeking behaviour. Ultimately, the goal is to improve the well-being and quality of life for those affected by depression, offering a proactive approach to mental healthcare.

III. LITERATURE REVIEW

Sabbir Ahmed" Taking All the Factors We Need: A Multimodal Depression Classification with Uncertainty Approximation" [1] The objective is to develop a multimodal approach for depression classification and estimate uncertainty in the classification results. It utilizes a combination of text and image data for depression classification. Incorporates deep learning models for feature extraction and uncertainty

estimation. The algorithm used is multimodal Neural network, Monte Carlo dropout, and spectral normalized neural Gaussian process.The Dataset used is D-vlog which is a multimodal vlog dataset composed of 961 YouTube vlogs. The entire duration of the dataset is approximately 160 hours, with an output label of ‘‘depressed’’ or ‘‘not depressed’’. The advantage is that it may provide more accurate depression classification by considering multiple data modalities. The disadvantage is that it requires a large and diverse dataset for reliable results.

Abdullah Ahmed,Jayroop Ramesh,Sandipan Ganguly” Evaluating Multimodal Wearable Sensors for Quantifying Affective States and Depression With Neural Networks.” [2] The objective is to assess the effectiveness of using multimodal wearable sensorsin quantifying affective states and detecting depression through neural network-based methods.It utilizes data from various wearable sensors to capture physiological and behavioural features. The algorithms used are employs neural networks for feature extraction and depression detection convolutional neural network (CNN) with an attention mechanism to highlight regions of interest in the extracted feature maps, connected to a random forest (RF) algorithm for the binary classification to avoid overfitting in the presence of scarce data.Daily Ambulatory Psychological and Physiological recording for Emotion Research (DAPPER) dataset that is a collection of self-reported psychological data and physiological recordings through smartphone apps and wearable wristbands to explore daily emotional experiences.The advantage of the Multimodal sensor data may provide a holistic view of an individual's emotional and physiological state. There is always the tradeoff between the privacy of personal data and the accuracy of developed models that need to be considered when new datasets are introduced.

Dabin Park,Semin Lim, ”Depression Emotion Multi-Label Classification Using Every time Platform With DSM-5 Diagnostic Criteria” [3].The objective is to perform multi-label classification of depression emotions based on DSM-5 diagnostic criteria using data from the every time platform. It utilizes natural language processing and machine learning techniques for text data analysis and multi-label classification. The algorithm used are specific natural language processing algorithms and machine learning models (e.g,LSTM, BERT) are employed for text analysis and emotion classification.The dataset used is a wellness conversation script dataset is a user chatbot conversation script created by extracting 4,200 cases, which are first-time visits from 16,000 consultation data received from Gangnam Severance and emotions. The advantage is that allows for the classification of multiple emotions related to depression based on established diagnostic criteria. The disadvantage is that it may be a limitation that it is difficult to directly apply our research to research in other languages

Gang Luo, Hong Rao,Panfeng An,Yunxia Li” Exploring Adaptive Graph Topologies and Temporal Graph Networks for EEG-Based Depression Detection.” [4] The objective is to investigate the use of adaptive graph topologies and temporal graph networks for detecting depression based on EEG (Electroencephalogram) data.It utilizes graph-based representation of EEG data with adaptive topologies and temporal graph networks for feature extraction and classification.The algorithm used are Adaptive Graph Topology Generation (AGTG) module and the Graph Convolutional Gate Recurrent Unit (GCGRU) module.The dataset used are EEG data collected from individuals with and without depression, enabling the development of a depression detection model.The advantages is Incorporates temporal information for improved feature extraction, potentially enhancing depression detection accuracy.The disadvantage is The need for a high-quality EEG dataset and specialized equipment for data collection.

Ruba S. Skaik, Diana Inkpen "Predicting Depression in Canada by Automatic Filling of Beck’s Depression Inventory Questionnaire" [5] The objective is to predict depression in Canada by automating the filling of Beck's Depression Inventory questionnaire. It utilizes natural language processing (NLP) and machine learning techniques to automatically fill out and analyze responses from Beck's Depression Inventory questionnaire. Specific NLP and machine learning algorithms is used for text analysis and depression prediction. The dataset used in this 192 research is based on the eRisk 2021 Task 3 (Measuring the 193 severity of the signs of depression). The advantage is that it offers a convenient and scalable way to predict depression by analyzing questionnaire responses. The disadvantage is that it is reliance on self-reported questionnaire data, which may not always reflect the true mental health status.

A-Hyeon Jo, Keun-Chang Kwak “Diagnosis of Depression Based on Four-Stream Model of Bi-LSTM and CNN From Audio and Text Information”[6].The objective is to diagnose depression using a four-stream model that combines Bi-LSTM and CNN for feature extraction from audio and text data. It employs a four-stream deep learning model with Bi-LSTM and CNN for feature extraction and classification based on audio and text information. It utilizes deep learning algorithms for audio and text data processing, including Bi-LSTM (Bidirectional Long Short-Term Memory) and CNN (Convolutional Neural Network). The dataset used are Extended Distress Analysis Interview Corpus-Wizard of

Oz (EDAIC-WOZ) depression dataset is an extended version of the Distress Analysis Interview Corpus Wizard of Oz (DAIC-WOZ) dataset. The advantage is Fusion of multimodal data for more accurate depression diagnosis. The disadvantage is the prediction of the severity of the condition.

Teng Guo, Wenhong Zhao, Mubarak Alrashoud "Multimodal Educational Data Fusion for Students' Mental Health Detection" [7].The objective is to detect students' mental health issues by fusing multimodal educational data using appropriate methodologies. It utilizes fusion techniques to combine various educational data modalities, such as academic performance, social interactions, and psychological assessments, for mental health detection. An algorithm, named MOON (multi-view social network embedding), Second, a synthetic minority oversampling technique algorithm (SMOTE) is applied to the label imbalance issue. Finally, a DNN(deep neural network) model is utilized for the final detection. The dataset used in this research includes 509 university students in the same school from a Chinese university and they are freshmen who have just finished their first semester exams. The advantage is that it offers acomprehensive approach to detect mental health issues by considering multiple aspects of students' lives. The disadvantage is that it requires access to diverse educational data sources, which may raise privacy and data sharing concerns.

IV. SYSTEM ARCHITECTURE

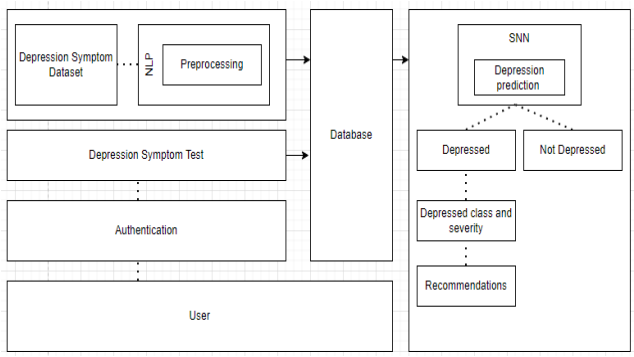

Fig: System Architecture Diagram

Description

The system process starts with the depression symptom dataset which goes through NLP preprocessing to standardize or extract useful information. The preprocessed data is then fed into SNN for depression prediction. The user logins into the system and takes the depression symptom test , the test results are then obtained. The SNN uses the information in the database to make a depression prediction. The prediction results in two outcomes: Depressed or Not depressed. For those identified as Depressed, the system further classifies the depressed class and severity , the severity is categorized into none, very low, low, moderate and severe. Based on the classifications, recommendations are provided to the user.

V. ALGORITHM

1.SNN

A neural network is a computational model inspired by the structure and function of the human brain. It consists of interconnected nodes, or neurons, organized into layers. Each neuron receives input signals, processes them, and produces an output signal. Neural networks are widely used in various fields, including machine learning, pattern recognition, image and speech recognition, and natural language processing. The basic building block of a neural network is the perceptron, which mimics the functionality of a biological neuron. A perceptron takes multiple input values, each multiplied by a corresponding weight, sums them up, and applies an activation function to produce an output. This output is then passed on to the next layer of neurons. A symptomatic neural network is a specialized type of neural network designed to predict and diagnose medical conditions based on symptoms and other relevant data. Trained on medical records and symptom profiles, it learns to recognize patterns indicative of specific diseases or health conditions. By analyzing input data, such as patient symptoms and test results, symptomatic neural networks can provide accurate diagnoses and prognoses, aiding healthcare professionals in decision-making and patient care. These networks play a crucial role in improving diagnostic accuracy, optimizing treatment plans, and enhancing overall healthcare outcomes.

2.NLP:

NLP can play a crucial role in preprocessing numerical data, especially in scenarios where the numerical data is accompanied by text or where textual context is relevant. Here's how NLP helps in preprocessing numerical data:

Text Cleaning: In situations where numerical data is accompanied by textual explanations, NLP techniques can be used to clean and preprocess the text. This includes tasks such as removing irrelevant characters, punctuation, or stop words, as well as standardizing text formatting.

Tokenization: NLP can tokenize the textual explanations associated with numerical data, breaking them down into individual words or tokens. Tokenization is essential for

further processing, such as feature extraction or sentiment analysis.

Feature Engineering: NLP can extract features from textual explanations to complement the numerical data. These features may include sentiment scores, word embeddings, topic distributions, or linguistic patterns, which can enrich the dataset and improve the performance of predictive models.
Contextual Understanding: NLP techniques help in understanding the context in which numerical data is provided.

VI.CONCLUSION

The development of a depression prediction system holds immense promise in revolutionizing mental health care and addressing the pervasive challenges associated with depression. By leveraging technology and machine learning algorithms, this system offers a proactive approach to identifying individuals at risk of depression before symptoms escalate, thereby enabling timely intervention and support. The integration of such a system into routine healthcare practices can enhance accessibility to mental health screening, particularly for underserved populations and remote communities. Additionally, its ability to personalize interventions based on individual risk factors ensures tailored and effective treatment strategies, ultimately improving outcomes and quality of life for those affected by depression

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