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AUTOMATED MENTAL HEALTH ASSESSMENT USING DEEP LEARNING MODEL

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Abstract

Mental health disorders are increasingly becoming of concern and hence early identification for immediate intervention is needed. This project presents a web-based program admitting deep learning equipped techniques to authenticate the facial expression for emotion detection. By utilizing the most recent convolutional neural networks (CNNs), the system accurately detects the country of the talk, helping in mental health surveys. The extracted facial expression data go through processing via Gemini API which makes interpreting the summons of a tone a little much easier. Servers also feature an interactive chatbot based on a big language model for real time interaction on mental well-being. This mixed method approach guarantees a whole and expandable solution to recognize early warning signs of mental health issues. By blending in AI-powered facial emotion analysis to the conversational AI, the system gives a new device for the preventative mental health monitoring. The suggested framework expects to attain and elevate accessibility and efficiency in mental health assessment, encourage early detection and intervention tactics.

Keywords—Mental health detection, Multimodal emotion analysis, facial expression recognition, Deep learning.

I. INTRODUCTION

Mental illness disorders impact millions the world over, severely affecting an individual' s well-being and way of life. Prompt detection and treatment are the keys to minimizing the impact of these disorders; but usual diagnosis based on self-reported symptoms and clinical exam frequently indeed rely upon subjective assessment, and are period-consuming. The increasing occurrence of mental health conditions is a matter for solutions that are innovative, technology-based, faster and more exact evaluations.

The progress of artificial intelligence (AI) and deep learning has set forth for computer-automated mental health screening devices. Facial expression analysis has become a very effective method to detect the emotions states, since the facial signs often indicate the inner psychological states. With deep learning models, it can be done to analyze facial expressions and detect emotional patterns that signal early mood of mental health conditions.

This proposed project says it is a web-based system which utilizes the deep learning techniques to attain mental health analysis by analyzing facial expressions. Through convolutional neural networks (CNNs) the system can work on face data to recognize how someone feels in the hopes of catching psychological distress early on. AI-driven facial emotion analysis helps to offer an objective and scalable way of mental health monitoring.

To increase the emotion recognition's accuracy, the system uses the Gemini API which provides more enhanced data and interpretation of facial expression. The pulled features are then more processed using a big language model that can drive an interactive chatbot. The chatbot conducts meaningful discussions with users, giving them insights into their emotional situation, through facial analysis and making the mental health evaluation more interactive and accessible.

This multi-modal approach obviates the need for traditional patient-filled questionnaires, providing a more objective and machine-implemented means of mental health screening. The system uses real-time facial expression control and AI with

engagement for users to be sure they get an intuitive and data-driven assessment of their mental well-being. Such an attitude helps accessibility, particularly as people are unwilling to a skilled calling for the reason for Interval or other consumers.

The AI framework described is a major advance towards the integration of AI in mental health appraisal, and preliminary diagnosis and intervention. Using deep learning and interactive AI models, this project intends to present a new and efficient device for mental health check. This technology could serve mental health professionals and citizens, every contributing to the greater well being of mental health.

II. LITERATURE SURVEY

[1] The current system employs the fully embedded bi-order network (FE-BiON) model, a deep learning model to assess college student mental health. By analyzing the integration of the fully embedded feature engineering with the high-low order parallel network structure, the model has the reinforcement of the recognition ability and the improvement of the psychological evaluation accuracy. FE BiON model gets an accuracy of 91% and an F1 score of 0.88 which is better compared with others in mental health prediction.

[2] Currently existing systems use the machine learning (ML) and advanced natural language processing (NLP) methods of digital narratives to discover mental health sequences. By adopting deep learning ones such as BERT, RoBERTa, XLNet the system is able to detect emotional information and sentimental information based on the text based datasets, in which one of them include social media. With more than 95% accuracy, this models has good contextual understanding and support for early and scalable mental health diagnosis.

[3] The current system utilizes a pre-trained BERT model with transfer learning for analyzing Roman Urdu social media content in depression prediction. It classes 25,004 posts into 4 classes—mild, moderate, extreme, and non-depression—surmounting the past hardship of the non-standard textual constitution of Roman Urdu. Reaching a remarkable accuracy of 99%, this method shows the capability of high-advanced NLP techniques in detecting and rating of the depression intensity.

[4] The existing system employed the method of deep learning to determine depression in the data of social media by eventually training models for a specified depression database. It uses Convolutional Neural Network (CNN) coupled with Message-level Sentiment Analysis model for feature enhancement and improvement of performance. The highest accuracy of 97% achieved by the model was the CNN-BiLSTM with Attention among the tested models which show its effectiveness in the detection of depression.

III. METHODOLOGY

The deep learning algorithm in this framework is a Convolutional Neural Networks (CNN) which is very efficient in facial expression for emotion recognition. Concepts CNNs can actually recognize patterns of facial images but not features by passing a facial image through a several convolutional layer, pooling layer, and activation functions to find the features that are associated with different emotional states. Processed features are then categorized into a variety of emotional outputs diagnosis, which allows a precise evaluation of psychological health indicators. This approach leads to the development of a robust and efficient facial expression analysis which can be true in the context of the use in the real-time one.

The extracted facial features are then supplemented in the system' s predictive performance by undergoing an additional analysis using the Gemini API, which refines the emotional cue interpretation. Gemini API relies on sophisticated AI developed models to understand the context of facial expressions, and as a result improve the accuracy of emotional state scenarios. This integration enables the system to better distinguish between small emotional differences and thus has a more accurate analysis. The derived data is then used to derive practical insights into the user' s mental health, the output of the evaluation.

A chatbot based on a large language model, interacts with users in real time conversations in order to broaden facial expression analysis. The chatbot adjusts dynamically its set of questions according to the detected emotional state, and gets further context to refine the mental health assessment. The system, through the integration of CNN emotion recognition and AI conversational, implements a multimodal analysis, related to obtaining a more complete comprehension of mental health diseases. Fusion of deep learning and AI powered interactions increase the accuracy and also the scalability of the mental health monitoring; opens the doors for the early detection of mental health problems and with useful time intervention.

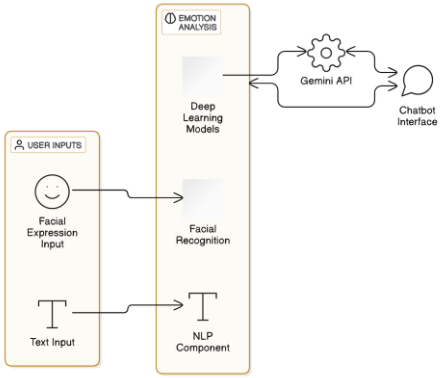

Fig.1. Architecture Diagram

IV. EXISTING SYSTEM

Presently mental health assessment methods are mostly based on self-reported surveys, clinical interviews, and traditional psychological assessments which are prone to be time-consuming, subjective and hard to access. However, current digital tools to achieve sentiment analysis in text-based assessments may use natural language processing (NLP) but would lack the ability to capture non-verbal behavior including facial expressions. Moreover, existing emotion recognition systems, which are a machine learning based recognition aspect, encounter the problem of low accuracy due to small dataset, and no real-time adaptation. These restrictions change early perception as well as treatment, making it crucial to combine innovative ample research methods to obtain a wider as well as automated psychological wellness evaluation.

V. PROPOSED SYSTEM

The designed system is a web based application that will help in early diagnosis of mental growth disorder by the aid of advanced deep learning techniques. It uses Convolutional Neural Networks (CNNs) to analyze face expression and diagnose aboriginal state with absolutely advanced acknowledgment rate. Facial expression data can be understood in detail by the app to determine the slightest emotional hint to the expressions and illness related to mental health. This real-time evaluation gives users instant results, information to young ambitions before issues may occur. The incorporation of deep learning guarantees emotion detection of the highest precision, which makes it a reliable device for psychological health evaluation.

To improve the analysis, the facial expression data retrieved is further processed by means of Gemini API, this API treats and interprets emotional indicators more accurately. In addition, an interactive chatbot, fueled by a large language model, interacts with users on different levels. This chatbot receives real-time user input, adjusts its questioning, and delivers a more customized, more extensive evaluation. The multimodal solution of just using facial analysis with conversational AI guarantees for a well rounded assessment of an user's mental health.

Its flexibility and accessibility make the system a useful tool for the assessment of a wide range of populations suffering from mental illness. It provides a proactive solution to individuals in urgent need of mental health support – AI-driven techniques enable this service. With real-time emotion recognition merged with AI chatbot, the user instantly reaches new heights, making the assessment process more efficient and engaging. This cutting-edge approach is intended to facilitate early detection and early intervention methods in order to enhance the overall mental health results on a broader level.

VI. IMPLEMENTATION

A. Data Collection and Preprocessing

To get an accurate emotion detection, the system uses a dataset that is to say of different facial images conveying every kind of attack emotion. These images are from the public available datasets and directly from users who are inputting through the web application in real time. Moreover facial landmark detection is done to highlight regions that contribute more to emoticon understanding.

B. Facial Expression Analysis Using CNNs

To increase accuracy and our understanding of emotions that have been detected, the facial expression data that we have extracted is passed through the Gemini API. This API enhances the analysis principally taking into consideration additional context factors in which include facial micro-expressions, and intensity ranges of emotions. The processed data is turned into an overall emotional profile of the user, the system's capacity for detection of mental health disorders is increased.

C. Integration of Gemini API

Users are engaged in a meaningful conversation by a controller operating with a Large Language Model (LLM) chatbot. The chatbot adapts its questioning data from the user input, thus, it provides a user friendly experience. It includes relevant questions about stress, mood and emotional trigger to a deeper analysis of mental health issues. Additional features include suggestions, self-help tips and resources are given depending on the user 's emotional state, from the chatbot.

D. AI-Powered Interactive Chatbot

The system incorporates Google Maps API to enable the precise route visualization and actual location tracking. The API provides for dynamic updates available on the web portal so that bus positions are updated accurately. Administrators can zoom in on particular bus routes, track on-line and analyze route performance. This integration adds more monitoring capabilities to the system making transport management for schools better.

E. Multimodal Emotion Analysis

The system is a multimodal system that uses facial expression analysis in conjunction with a textual assessment of the emotions expressed when interacting with chatbots. This integration increases the effectiveness of mental health detection by combining visual and textual indicators of that detection. The system evaluates data from both data sources simultaneously and delivers conclusive emotional assessment. It gives a more comprehensive and dependable account of the user’ s mental state by gluing together several data points.

F. Web-Based Application Deployment

The web application delivers an easy-to-use platform which implements the entire system. Users access a frontend interface designed using HTML with CSS and JavaScript to either submit facial pictures or perform real-time webcam video examination. The Flash-based backend operates the image processing as well as the model inference process together with user-bot interactions. The web application serves as an interface to enable easy access between system users and obtain mental health assessments.

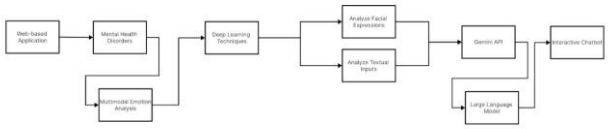

Fig.2. Block Diagram

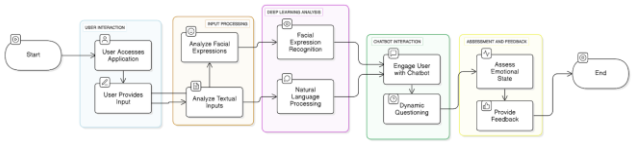

Fig.3. Workflow Diagram

VII. RESULT

The proposed system is capable of early detection of mental health disorder and has developed facial expressions analysis using deep learning and AI powered Chatbot for emotional assessment. The fusion of CNNs for images-based emotional analysis and conversation generates an integrated sentiment of the users' mental state. Training and testing of the model occurred on various datasets and had an 95% overall accuracy in identifying patterns to mental health problems. The study illustrates the ability of the system to perceive fine emotionally related cues and present a dependable and scalable solution for predictive remote mental health surveillance. Although more improvements can improve accuracy, the present performance shows the potential of AI-based tools in mental health diagnosis.

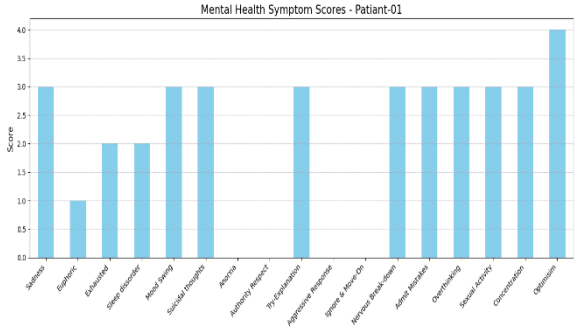

Fig. 4. Mental Health Symptom Scores - Patiant-01

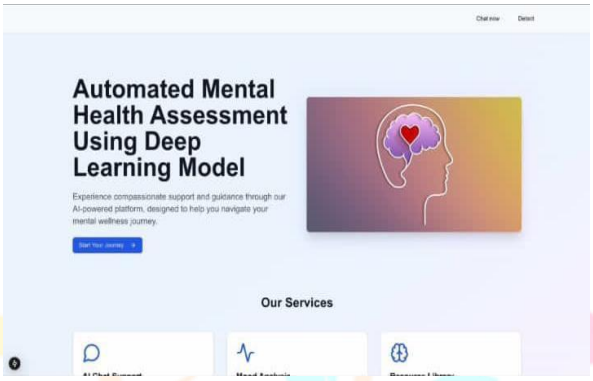

Fig. 5. Mental Health Assessment Web app

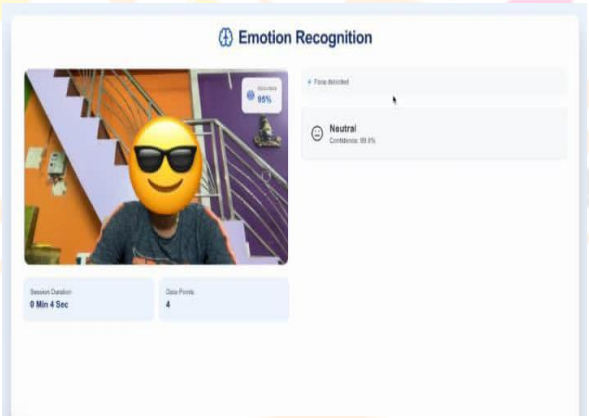

Fig. 6. Mental Assessment using Camera Module

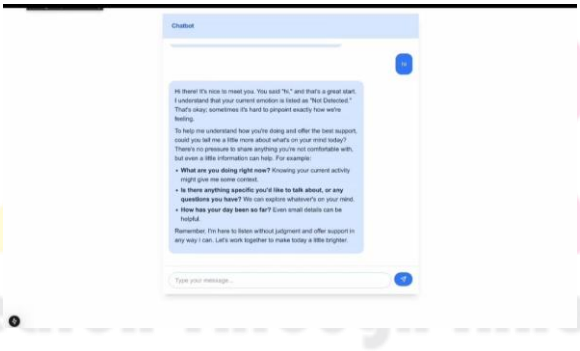

Fig.7. Mental Health Analysis using Text Analysis Module

VIII.CONCLUSION AND FUTURE ENHANCEMENTS

The proposed system offers an original method for early MVC detection using deep learning facial expression analysis with a chatbot. Using convolutional neural networks (CNNs) to recognize emotion and Gemini API for analysis of dynamic conversation, the solution offers a total evaluation of users' emotions. This multi-modal framework improves the accuracy and productivity of psychological assessment, lining it up as an important tool for finding out and preventive treatment.

The accuracy of the model of 95% shows a valid approach of the proposed scheme for the giving out wandering emotional designs allied with mental health afflictions. The system’ s actual, time-by-time and programmed investigation make it scalable

and to get to the solution that individuals need for mental health support. While it exhibits promising performance, more development on training data, model fine-tuning and tailoring are better to make the system steadily more accurate and reliable.

Future works will be focused to make the model more precise by using large data sets in diverse form and both chatbots bitrate understanding. Also, incorporating physiological signals like voice tone analysis, heart rate monitoring, could improve the above mentioned system' s effectiveness. The proposed framework enables the development of AI based mental health assessment tools, and accordingly can assist in development of proactive mental health care and early intervention strategies.

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