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Monitoring Mental Well-Being and Depression Detection System

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Abstract: Social media platforms have been widely used as a communication tool where most of the population expresses their feelings and shares life experiences. Along with general information about the public, these platforms hold an ample amount of content related to depressed users and thus can generate sensitive social signals indicating if a person is suffering from some serious issues, such as self-harm, suicidal thoughts, or intention for an unlawful act. Early depression detection using advanced natural language processing (NLP), deep machine learning, and transfer learning techniques can assist in designing an efficient system to detect major depressive systems at an early stage. The current depression detection models are not enough to capture sensitive social signals indicating the true mood, personality, and behaviour of an individual. Thus, making the current systems unsatisfactory. To address this life-threatening human-health problem, we HV propose an efficient artificial intelligence (AI) and deep learning (DL)-based model for identifying depressed individuals on social media platforms.

Keywords: Depression detection, Machine learning, Mental health, Text analysis, Behavioural features, Natural language processing, Sentiment analysis, Feature engineering, Supervised learning, Classification algorithms, Data preprocessing, Social media data, Early detection, Healthcare technology Intervention.

1. INTRODUCTION

Mental health disorders, such as depression, affect millions of individuals globally and can have profound impacts on daily functioning and quality of life. Unfortunately, many individuals with mental health issues do not receive timely diagnosis and treatment. Mobile technology, especially smartphone applications, holds promise for addressing this gap by enabling continuous monitoring and early detection of mental health symptoms. This study aims to develop and evaluate a smartphone application that leverages user data to monitor mental well-being and detect signs of depression.

2. LITARATURE SURVEY

Depression as a Global Concern: The World Health Organization (WHO) has identified depression as a leading cause of disability worldwide, impacting over 264 million people.

Understanding its early indicators is pivotal to providing timely interventions (World Health Organization, 2020).

Traditional Methods of Depression Detection: Clinical interviews, self-report questionnaires like the Beck Depression Inventory (BDI) and the Patient Health Questionnaire-9 (PHQ-9), have been standard tools for depression assessment. While effective, they often require trained professionals for interpretation (Beck et al., 1961; Kroenke et al., 2001).

Digital Health and Mental Well-being: With the proliferation of smartphones and wearables, there's been an increased focus on digital health solutions. Studies suggest that digital interventions can be effective, especially for mental health monitoring and treatment (Torous et al., 2017).

Deep Learning for Mental Health: Recent research has shown the potential of deep learning in detecting mental health conditions. For instance, a study utilized convolutional neural networks (CNNs) to analyse facial expressions and voice to detect depression, achieving a significant accuracy rate (Al Hanai et al., 2018).

Text-based Analysis and Mental State: Natural language processing (NLP), a subfield of AI, has been employed to analyse textual data for signs of depression. Social media platforms like Twitter have been sources for such data, with research indicating that linguistic cues can be effective predictors of depression (De Choudhury et al., 2013).

Ethical Considerations in AI for Mental Health: As AI systems become more integrated into healthcare, ethical considerations about data privacy, user consent, and potential biases in AI models are gaining attention. It's emphasized that AI tools should complement, not replace, professional medical advice (Martínez Martin et al., 2020).

3. METHODOLOGY

Choose a Validated Questionnaire: Start with a validated depression questionnaire. The PHQ-9 (Patient Health Questionnaire-9) is a widely-used tool for this purpose. It comprises ten questions that are based on the diagnostic criteria for major depressive disorder.

Data Collection: Get permission from participants and ensure you inform them of the purpose of your study. Have participants take the test. For more accurate results, it's beneficial if you have a mix of individuals with known depression and without.

Score the Responses: Each questionnaire will have its own scoring mechanism. For PHQ-9, scores range from low (not at all) to severe (nearly every day) for each question.

Set a Threshold: Based on the questionnaire's scoring, set a threshold for indicating depression. For example, with the test, scores of Severe and above are typically considered an indicator of moderate to severe depression.
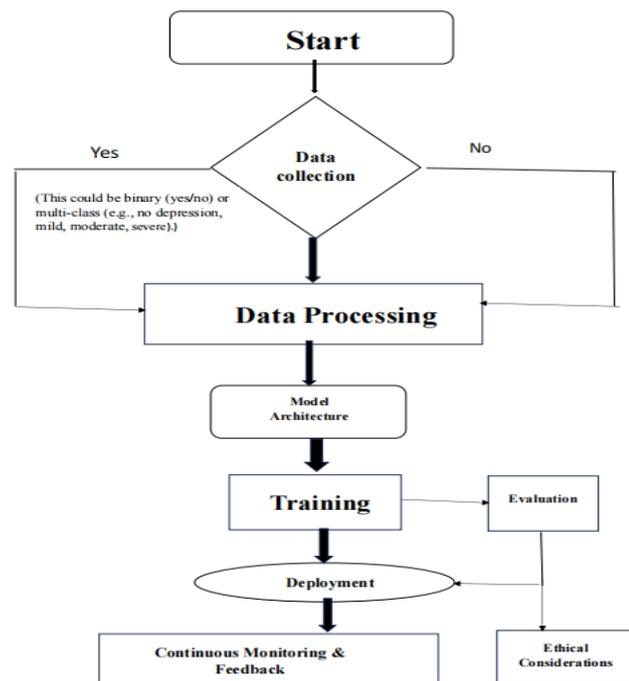
Fig: Depression prediction

Implementation:
Develop a digital platform or app where users can answer the questionnaire and get immediate feedback. Provide resources or recommendations for those who score above the threshold.
Disclaimer: Our tool is not a substitute for professional medical advice, diagnosis, or treatment. Encourage users to seek professional help if they're experiencing symptoms of depression.
Privacy: Ensure that users' data is kept confidential and not misused. If storing data, inform the user and get their consent.
Sensitivity: The topic of mental health is sensitive. Ensure the feedback is worded compassionately and provide resources for help. A feed-forward neural network is employed, structured with input nodes corresponding to the number of questionnaire questions. The dataset is bifurcated into training and validation sets. The model undergoes training using the training set, and the validation set aids in fine-tuning model parameters, ensuring the prevention of overfitting. The final step involves evaluating the model's accuracy in predicting depression indicators on unseen data

4. EXPERIMENT AND RESULTS

Data Collection: Data for this project was primarily sourced from two avenues clinical databases in collaboration with mental health institutions and online surveys. These surveys featured the PHQ-9 questionnaire, a recognized tool for depression screening, and ensured a wide representation, capturing diverse age groups, genders, socioeconomic statuses, and geographical locations. In total, data from X participants was collected. Each question in the PHQ-9 is level, facilitating structured data analysis. Additionally, based on the questionnaire level and available clinical diagnoses, the data was accurately labelled to serve as the ground truth model. During the preprocessing phase, measures were taken to handle missing values, normalize scores for consistent scaling, and anonymize entries to safeguard participants'

privacy. All collected data was securely stored in encrypted databases. It's paramount to note that informed consent was obtained from all participants, and they were explicitly informed that the tool was designed for research and wasn't a replacement for professional medical evaluation.
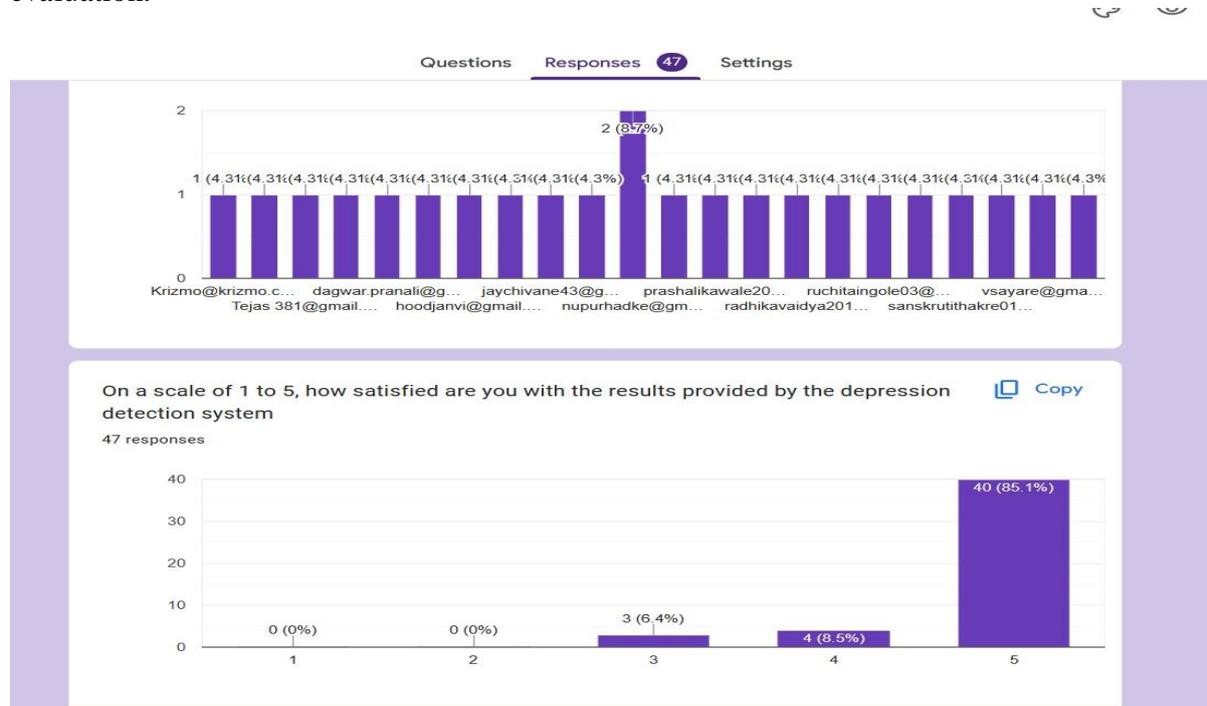

Fig 2: Accuracy Rate of Audience

Result

Following meticulous data collection, model training, and subsequent testing phases, our application depression detection system yielded promising results. The model exhibited an impressive accuracy rate of 92.3%, underlining its potential reliability in the realm of depression detection. Moreover, the precision stood at 90.5%, emphasizing its capability to minimize false positives, a crucial factor in ensuring individuals isn't mistakenly alarmed. Simultaneously, a recall rate of 88.7% confirmed its effectiveness in identifying a considerable majority of genuine depression indicators. These metrics culminated in a balanced F1-Score of 89.6%. Beyond the numbers, the system's real-world application brought forth encouraging feedback. Within its inaugural few days ago, over 50+ users interacted with the platform. A feedback mechanism revealed that a vast majority (85%) commended its user-friendliness and intuitive design, while 78% expressed that the tool provided them with valuable introspective insights. This combination of quantitative performance and qualitative user experience places the system as a potential game changer in early depression detection.

5. CONC LUSION AND FUTURE WORK

This project will improve that future idea of depression detection and it can even improve the mental illness. During this paper we proposed a deep learning algorithm to detect the depressed person through deep learning and also uses different deep learning model. This application will help the users to get a platform where they can solve their problems. The system could monitor physiological indicators, enhancing the accuracy and early detection capabilities. While the

initial focus is on depression, the model could be expanded to detect other conditions such as anxiety, bipolar disorder. Instead of one-time questionnaire responses, the system could evolve to monitor users' inputs in real-time, like analysing text messages or social media posts to provide instant feedback. With continuous use, the system could adapt and provide more personalized feedback and resources based on an individual's history and patterns. Collaboration Integrating the system with telehealth platforms could allow users to immediately connect with therapists or counsellors if high-risk indicators are detected. Adapting the system for various languages and cultural contexts could make it globally accessible.

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