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HYBRID MODEL FOR DEPRESSION DETECTION USING DEEP LEARNING

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Abstract: Millions of people are suffering from mental illness due to unavailability of early treatment and services for depression detection. It is the major reason for anxiety disorder, bipolar disorder, sleeping disorder, depression and sometimes it may lead to self-harm and suicide. Thus, it is a very challenging task to recognize people who are suffering from mental health disorders and provide them treatments as early as possible. In this proposed system, we are developing a hybrid model for depression detection using deep learning algorithms, by analysing textual features and audio features of patient's responses. Proposed system consists of a textual CNN model in which a CNN model is trained with only text features and an audio CNN model in which CNN model is trained with only audio features. System uses model parameters such as precision, F1-score, recall and support are found for evaluation of models.

Keywords: Depression Detection, Deep Learning, Hybrid Model, Textual Features, Audio Features, Convolutional Neural Network (CNN), Early Intervention, Mental Health Disorders, Machine Learning, Data Collection, Feature Extraction, Precision, F1-Score, Recall, Support, Mental Health Support, Text Analysis, Audio Analysis, System Architecture, System Requirements

I. INTRODUCTION

Depression is a medical condition and it is one of the most common mental illness which affects millions of people globally. Depression is considered as a dangerous disease, which not only affects mental state of a person but also cause physical harm to a patient. Severity of Depression is predicted in terms of mental health condition of a patient. Most frequent cases of Mental Health Disorders include anxiety disorder, restlessness, sleeping disorder, eating disorder, addictive disorder, Depression, Trauma, and stress related disorders. Depression is a type of mental illness in which a patient continuously feels hopelessness, demotivation, bad mood swings and loss of interest in daily physical, mental and social activities which leads to emotional damage and physical changes in a patient's body. It specially affects learning capacity in a person, causes mood fluctuations and it often reduces work efficiency in a person.

A depressed patient has different symptoms based on its severity. In high severity, brain activity goes slow down and produces the hormone cortisol which affects the growth of neurons in brain. It badly affects the thought process of a person and sometimes it may lead to suicidal cases.. There are some treatment options that are available, treatments and services vary from counselling sessions to therapies. Brain simulation treatments are also available.

According to a survey conducted by WHO, approximately 280 million people are suffering from depression worldwide, nearly 800000 cases of suicide due to depression reported every year worldwide. Depression is the fourth leading disease in this world, it became a leading problem which affects people of all age groups children, teenage, adults, old age people. More than 80% people not get proper treatment due to unavailability of early services and treatments for depressed patients.

Traditional therapies and medications for depression such as psychotherapy or pharmacological services are mostly time consuming, expensive, and ineffective. Major problem with these traditional methods is that, firstly these depression detection techniques need more patient data, their background, their history, and any past trauma related information, to predict symptoms of depression or these treatments need continuous monitoring on patient activities for prediction of depressed patient or not. And secondly, patients intentionally hide their real response and conditions from doctors intentionally due to pressure from society and then they often mislead the treatment which consume more time for diagnosis

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II. LITERATURE SURVEY

In [1] Arselan Ashraf Et. Ed [1] in "**A Summarization of the Visual Depression Databases for Depression Detection** " presents a brief summarization regarding ten depression datasets available, which will guide the researchers to select an appropriate dataset for their depression detection models. This summarization has been done over the non-verbal signs of depression, data collection techniques, clinical definition, and annotations. Moreover, a tabular list of datasets is provided for quick and easy look through.

In [2] J.M. Imtinan Uddin Et. ED [2] et. Ed [in "**Depression Risk Prediction among Tech Employees in Bangladesh using Adaboosted Decision Tree** " aims to predict the depression risk of a tech employee and determine the root cause of depression so that it becomes easier to treat depression at an early stage. In adaptive boosting, errors of previous models are corrected. The features of the dataset that were used to train and test the machine learning model was determined by a psychiatrist by rigorous analysis.

In [3] Brindahini Vimaleswaran et. Ed[3] in "**E Therapy Improvement Monitoring Platform for Depression using Facial Emotion Detection of Youth** " proposed solution consists of depression prediction using feed – forward neural network model and Depression scale to measure the depression level. Calculating the improvement level is based on the depression levels identified and finally Visual represented in a dashboard to monitor depression level improvements for the therapist and the patient.

In [4] Faisal Muhammad Shah et. Ed [4] in "**Early Depression Detection from Social Network Using Deep Learning Techniques** " proposed a hybrid model hat can detect depression by analyzing user's textual posts. Deep learning algorithms were trained using the training data and then performance has been evaluated. Early Detection of Depression in CLEF eRisk 2017. In particular, Bidirectional Long Short Term Memory (BiLSTM) with different word embedding techniques and metadata features were proposed which gave good results.

In [5] Slim Ben Saoud et. Ed [5] in "**Hybrid CNN-SVM classifier for efficient depression detection system** " present a novel audiobased approach to automatically detect depression using hybrid model. This model combines convolutional neural networks (CNN) and support vector machines (SVM), where SVM takes the place of the fully connected layers in CNN. In this

III. SCOPE AND METHODOLOGY

Aim of the project
The aim of the project is to develop a hybrid model for depression detection using deep learning algorithms, which combines analysis of textual and audio features from patient responses. The goal is to create a more accurate and timely method for identifying individuals suffering from depression, ultimately improving patient outcomes and mental health support.

Existing system
Existing methods for depression detection primarily rely on traditional therapies and medications, which can be time-consuming, expensive, and ineffective. These methods often require extensive patient data and continuous monitoring, leading to delays in diagnosis and treatment.

Conventional approaches may suffer from low accuracy, resulting in limited effectiveness in identifying individuals suffering from depression. As a result, there is a pressing need for advanced techniques that can improve the accuracy and timeliness of depression detection to mitigate the adverse consequences associated with undiagnosed or untreated depression.

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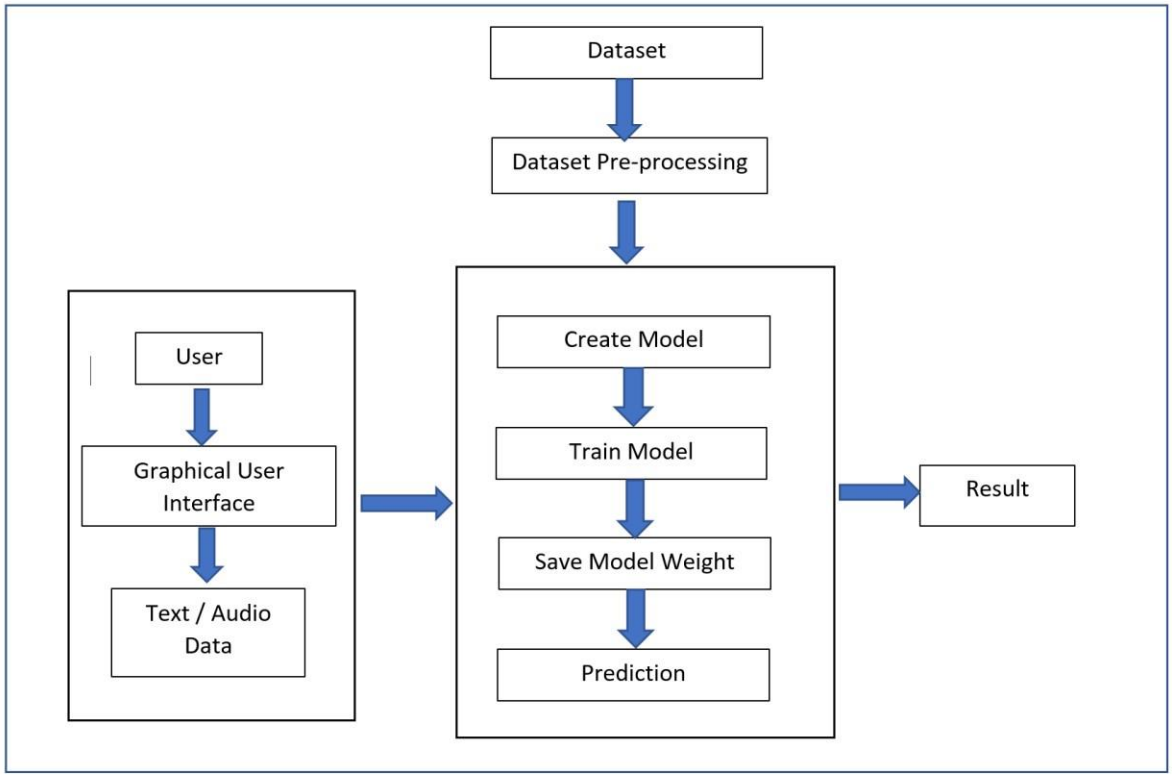
IV. METHODOLOGY



Above Fig shows the architecture of the proposed system. System contains Four main modules called Pre-processing, Model creation, System Training and Classification. Pre-processing module is used to pre-process the dataset images by resizing them to required dimension. Model Creation module is used to construct a machine language model using desired number of layers. System training phase is used to train the system with dataset images and store the model weight. Classification module is used to classify the input text or audio data to determine whether user depressed or not.

SYSTEM REQUIREMENTS

SOFTWARE REQUIREMENTS

- Operating System : Windows 7 or above/ Linux
- Programming Languages : Python, CSS, Java Script,
- Web browsers : Google chrome/Mozilla Firefox/internet explorer
- Database : MYSQL
- IDE : Visual Studio Code,
- Web framework : Django
- ML framework : Keras

HARDWARE REQUIREMENTS:

- Processor :1 GHZ or higher CPU
- Hard disk : 500 MB available internal storage
- Memory : 8GB of RAM is minimally recommended
- Display : 2.8 inches or larger

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EXPECTED OUTCOMES

Proposed system has following outcomes:

- System should receive input text and audio data from end user and need to classify the input text and audio data either as normal or depressed.
- System should develop a CNN model using Keras framework to train and classify end user's text and audio data.
- System should have a graphical user interface to help end user to use the system easily.

V. CONCULSION

In conclusion, the proposed hybrid model offers a promising solution for accurate depression detection. By combining textual and audio features, it aims to enhance the effectiveness of diagnosis compared to conventional methods. Leveraging deep learning algorithms, this system enables timely intervention and personalized treatment strategies. Its potential to improve patient outcomes underscores its significance in advancing mental health care. Further research and development in this area hold promise for addressing the global challenge of depression detection and treatment.

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