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Detection Of Early Stage Depression

B C Divakara[1], Manvitha R[2], K N Lavanya[3], Kanaka Jyothi R[4]

[1] Assistant professor ,Department Of Electronics and Communication, Global Academy Of Technology, Bangalore

[2,3,4] Student, ,Department Of Electronics and Communication, Global Academy Of Technology, Bangalore

Abstract: Depression is a mood disorder that causes a persistent feeling of sadness and loss of interest . so called major depressive disorder or clinical depression, it affects how you feel think and behave and can lead to a variety of emotional and physical problems. You may have trouble doing normal day-to-day activities, and sometimes you may feel as if life isn't worth living.

Early detection and treatment of depression are essential in promoting remission, preventing relapse, and reducing the emotional burden of the disease. Current diagnoses are primarily subjective, inconsistent across professionals, and expensive for the individual who may be in dire need of help. Additionally, early signs of depression are difficult to detect and quantify. These early signs have a promising potential to be quantified by machine learning algorithms that could be implemented in a wearable artificial intelligence (AI) or home device.

This effort addresses an automated device for detecting depression from acoustic features in speech. The tool is aimed at lowering the barrier of entry in seeking help for potential mental illness and supporting medical professionals' diagnoses. Another method of implementation is through social media data. The social media platform to be used is Twitter. Live tweets are analysed and the model is trained. The project aims to have a dual mode of working between detection through audio and social media data.

Keywords: Machine Learning, Deep Learning, Convolutional Neural Networks, Feature Extraction, Depression Detection, Spectrogram Conversion.

INTRODUCTION

Machine learning (ML) is the study of computer algorithms that improve automatically through experience. Machine learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning algorithms build a mathematical model based on sample data, known as "training data", in order to make predictions or decisions without being explicitly programmed to do so. Machine learning algorithms are used in a wide variety of applications, such as email filtering and computer vision, where it is difficult or infeasible to develop conventional algorithms to perform the needed tasks.

Supervised machine learning algorithms can apply what has been learned in the past to new data using labels. Starting from the analysis of a known training dataset, the learning algorithm produces an inferred function to make predictions about the output values.

Unsupervised machine learning algorithms are used when the information used to train is neither classified nor labeled. Unsupervised learning studies how systems can infer a function to describe a hidden structure from unlabeled data. Semi-supervised machine learning algorithms fall somewhere in between supervised and unsupervised learning, since they use both labeled and unlabeled data for training, typically a small amount of labeled data and a large amount of unlabeled data.

Reinforcement machine learning algorithms is a learning method that interacts with its environment by producing actions and discovers errors or rewards. Trial and error search and delayed reward are the most relevant characteristics of reinforcement learning.

Neural networks have enabled state-of-the-art approaches to achieve incredible results on computer vision tasks. Neural networks have been shown to be especially powerful when it gets deeper and wider. Convolutional Neural Networks (CNNs) have been established as a powerful class of models for various problems. Feature extraction from audio data is one of the most important problems in this domain for which many approaches have been suggested. Among other modern tools, convolutional neural networks (CNN) have recently been applied for automatic feature selection and prediction.

The scope of the project is to plan, design, build, and implement a model which can detect the distress and depression of a person.Two different ways of doing it are provided in order to get a better prediction of the condition. Each of the ways will incorporate an interface allowing users to provide a different input on which the trained model can predict the status of mental health. Program dashboards will contain buttons, suggestions and further action to be taken. The scope of this project includes all requirements gathering, planning, design, development, and implementation of the project "Early Stage Depression Detection Using Machine Learning".

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I. RELATED WORK

Existing Depression Detection systems can be categorised into two groups. The first group of systems use very little data and prediction is carried out based on the inputs provided to the system. The second group of systems involve a higher amount of data and hence predict more accurately. The study shows that the data is collected from various participants by performing human computer interactive evaluation and hence taking measures based on the inputs provided.
The model achieves a good result considering they have only used audio sentiments. The classification techniques based on linguistic style, emotional process, temporal process are able to successfully extract the depressive emotional result. The study describes that the model focuses only on audio sentiment and textual features recognition for the task. Hence the expected result obtained will be more accurate compared to the model involving only audio or text analysis.
Many researchers used various machine learning algorithms like convolution neural network(CNN), recurrent neural network, support vector machine, CNN-Long Short Term Memory network for recognition of the audio and textual analysis. Our proposed project uses both audio and textual recognition analysis involving two models tuning the hyper-parameters like the audio or text in order to get good accuracy in classifying and predicting early stage depression.

II. PROPOSED SYSTEM

The audio dataset consisting of several interviews is cleaned. As the features of audio segments of the participants are useful for classification, the segments are split by silence removal. In the data-set, the number of non-depressed subjects is about four times larger than that of depressed ones, which can introduce a classification “non-depressed” bias. To rectify this imbalance, audio segments are randomly sampled in equal numbers. The sampled audio segments are then converted to spectrogram images.

These images are converted to TensorFlow tensor using flow from the directory of image processing data generator method. The image tensor is normalised and fed into the Convolutional Neural Network. The Model will be trained with a huge number of spectrogram images. The Model will be trained until the validation accuracy is saturated. The second method of implementation is through social media data. The social media platform to be used is Twitter. Live tweets are analysed and the model is trained.

III. ALGORITHM

Convolutional Neural Network : A **Convolutional Neural Network (ConvNet/CNN)** is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other. The pre-processing required in a CNN is much lower as compared to other classification algorithms. While in primitive methods filters are hand-engineered, with enough training, CNN have the ability to learn these filters/characteristics.

Naive Bayes classifiers : Naive Bayes classifiers are a collection of classification algorithms based on **Bayes’ Theorem**. It is not a single algorithm but a family of algorithms where all of them share a common principle, i.e. every pair of features being classified is independent of each other.

Decision tree : Decision Tree is the most powerful and popular tool for classification and prediction. A Decision tree is a flowchart like tree structure, where each internal node denotes a test on an attribute, each branch represents an outcome of the test, and each leaf node (terminal node) holds a class label.

Support Vector Machine(SVM) :“Support Vector Machine” (SVM) is a supervised machine learning algorithm which can be used for both classification or regression challenges. However, it is mostly used in classification problems. In the SVM algorithm, we plot each data item as a point in n-dimensional space (where n is number of features you have) with the value of each feature being the value of a particular coordinate. Then, we perform classification by finding the hyper-plane that differentiates the two classes very well.

K-Nearest Neighbors Algorithm : K-Nearest
Neighbour is one of the simplest Machine Learning algorithms based on Supervised Learning technique. K-NN algorithm assumes the similarity between the new case/data and available cases and put the new case into the category that is most similar to the available categories. K-NN algorithm stores all the available data and classifies a new data point based on the similarity. This means when new data appears then it can be easily classified into a well suite category by using K-NN algorithm. K-NN is a non-parametric algorithm, which means it does not make any assumption on underlying data.

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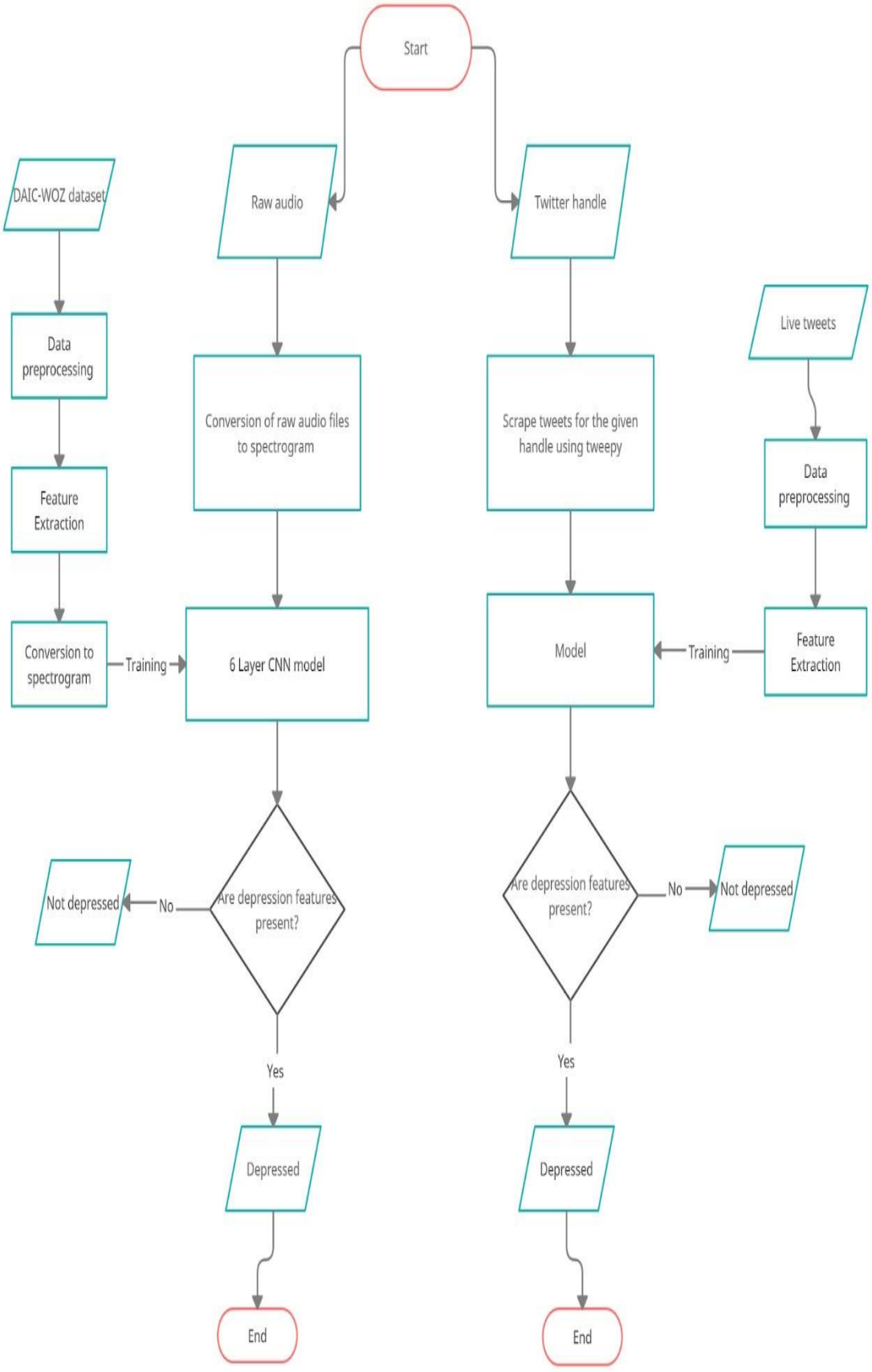

Fig. 1 : Proposed System Architecture

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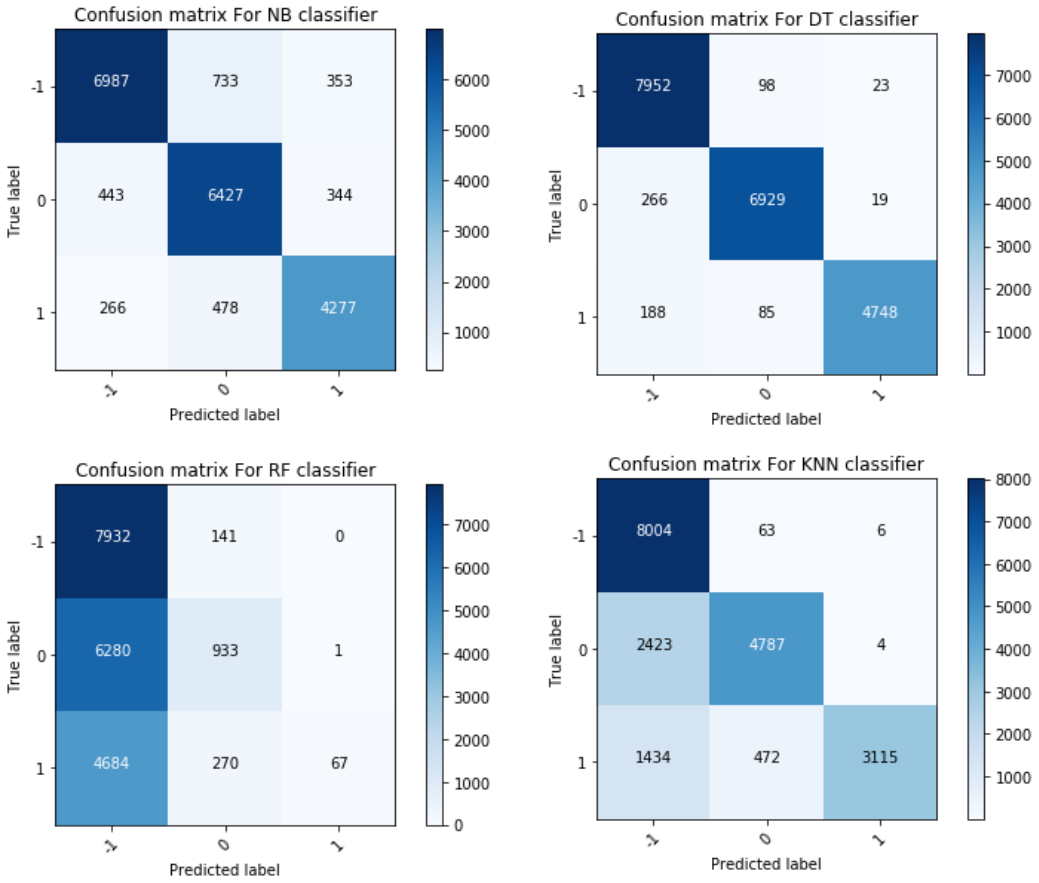

Fig. 2 : Twitter Simulation Confusion Matrix

Random Forest : Random Forest is a classifier that contains a number of decision trees on various subsets of the given dataset and takes the average to improve the predictive accuracy of that dataset." Instead of relying on one decision tree, the random forest takes the prediction from each tree and based on the majority votes of predictions, and it predicts the final output. The greater number of trees in the forest leads to higher accuracy and prevents the problem of overfitting.

SIMULATION RESULTS

Decision tree Accuracy : 96.73851084032789 %

Naive Bayes Accuracy : 91.38426940727405 %

Kneighborsclassifier Accuracy : 79.66245178375372 %

Support vector machine Accuracy : 50.0 %

Random Forest Accuracy : 49.88654441429075 %

Five algorithms were used in twitter implementation, after comparing all of them, Decision Tree was found to have highest accuracy level. Hence Decision Tree was retained among all other algorithms.
The confusion matrix is as shown in Fig 3.

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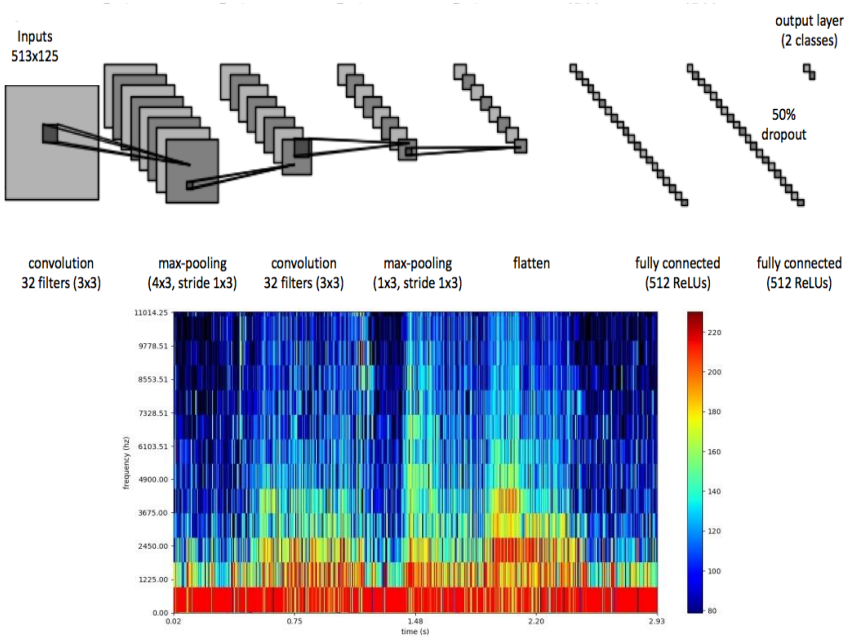

III. CONCLUSION AND FUTURE WORK

Conduct of a depressed individual relatively changes in terms of speech when contrasted with a non-depressed individual. In this project, we presented depression recognition through the use of audio features utilizing the CNN's. Verbal reactions of the individual coded as audio features hold the data with respect to the conduct of the individual. Textual interactions of an individual in the form of tweets, status updates and posts also hold data with respect to be the mental state of an individual. The use of two methods mitigates the false positives obtain in either case and leads to a more accurate result. Depression is a medical illness that affects an individual negatively by changing the way one feels, think and act but luckily, it's treatable, so the problem is its detection which we can solve with the help of machine learning.
Depression moves across a spectrum, so deriving a binary classification (depressed, not depressed) from a single test is somewhat naive and perhaps unrealistic. The threshold for a depression classification was a score of 10, but how much difference in depression-related speech prosody exists between a score of 9 (classified as not depressed) and a 10 (classified as depressed)? For this reason, the problem may be better approached by using regression techniques to predict participant's scores and scoring the model based on Root Mean Square Error (RMSE). We would prioritize future efforts as follows:
Implementing the model for Indian languages.
Sampling methods to increase training size without introducing class or speaker bias.

REFERENCES

[1] Shubham Dham, Anirudh Sharma, Abhinav Dhall, "Depression Scale Recognition from Audio, Visual and Text Analysis".
[2] Ezekiel Victora Zahra M. Aghajan, Amy R. Sewart, C.Philc Ray Christian, "Detecting Depression Using a Framework Combining Deep Multimodal Neural Networks with a Purpose-Built Automated Evaluation".
[3] Himani Negi, Tanish Bhola, Manu S Pillai, Deepika Kumar, "A Novel Approach for Depression Detection using Audio Sentiment Analysis".
[4] Md Rafiqul Islam, Ashad Kabir, "Depression detection from social network data using machine learning techniques".
[5] Jonathan Gratch, Ron Artstein, Gale Lucas, Giota Stratou, Stefan Scherer, Angela Nazarian, Rachel Wood, Jill Boberg, David DeVault, Stacy Marsella, David Traum, Skip Rizzo, Louis-Philippe Morency, "The Distress Analysis Interview Corpus of human and computer interviews ".
[6] Betul Aya, Ozal Yildirimb, Muhammed Talob , Ulas Baran Baloglub , Galip Aydina , Subha D.Pc , U Rajendra Acharyad, "Automated Depression Detection Using Deep Representation and Sequence Learning with EEG Signals

BIOGRAPHY

Mr. B C Divakara is an assistant professor in the Department of Electronics and Communication Engineering, Global Academy ofTechnology, Bengaluru.