Depression Level Detection Using Machine Learning

Background Study:

Depression is the most common mental disorder worldwide and currently the fourth largest contributor to the burden of disease as reported by the World Health Organization. Some machine learning approaches have been proposed in recent years, using audio signals for depression analysis. There is a wealth of research, meanwhile, which shows that voice variations have a strong correlation with emotion and stress. In different fields, deeply-learned features based on neural networks have demonstrated superior performance to hand-crafted features. Firstly, Deep Convolutional Neural Networks (DCNN) are constructed in this paper to learn deep-learned features from spectrograms and forms of raw speech wave[1]. The Depression, Anxiety and Stress Scale questionnaire (DASS 21) gathered data from working and unemployed individuals across various cultures and societies. Five levels of anxiety, depression and stress were expected to occur. Five separate machine learning algorithms predicted anxiety, depression and stress as occurring at five stages of severity-because these are highly accurate, they are especially suited to predicting psychological problems[2]. For accurate and timely prediction of a person's emotions, smart systems are required to evaluate the symptoms and operate on the data sets. Also, under various conditions to detect emotional imbalance, a test based on AI algorithms.

Objective:

- To recommend a model focused on data-analytics to identify any human being's depression.
- Use the DCNN raw and waveform to model the characteristic depression data.
- Using the Depression, Anxiety and Stress Scale questionnaire, the concentrate was on identifying anxiety, depression and stress (DASS 21).

Motivations:

To develop an automated system for the diagnosis of depressed patients, the emotional phase is combined with their respective emoji. The characteristics of the emotional process and gestures will be extracted and state-of-the-art classifiers have been suggested to be qualified and tested using various classifiers using various part-of-speech tag variations. If the framework can reliably predict someone's actual degree of depression, it would be unparalleled. Although there are already current machine learning models in this delicate field that demonstrate great promise.

Methodology:

Interface architecture or extract features plays an important role in assignments for depression research. We integrate hand-crafted features with deeply-learned features in this work to measure the magnitude of depression. They utilize DCNN to recognize the deep-learned features from the photos of raw audio and spectrograms[1]. To assess five different levels of severity of anxiety, depression and stress, machine learning algorithms were applied. Decision Tree (DT), Random

Forest Tree (RFT), Naïve Bayes, Support Vector Machine (SVM) and K- Nearest Neighbour (KNN) were applied to five different classification techniques. It was found that the accuracy of naïve Bayes was the highest, although the best model was described as Random Forest[2].

Contributions of the work:

It is possible to summarize up the key contributions of this work as follows:

Firstly, we are creating an automated system that can accurately collect vocal data to assess the intensity of depression. Second, to measure the magnitude of depression, we find that complementary characteristics exist between hand-crafted features and profoundly learned features. Third, in order to accurately assess the magnitude of depression from speech, we recommend a mixture of handcrafted and deep-learned features. For classification, various machine learning algorithms such as Logistic Regression, Catboost, Naïve Bayes, RFT and SVM were applied.

Lacking of the work:

We introduced a new approach focused on deep learning and conventional methods to enhance the precision of automated depression recognition from speech signals. The best model option was done on the basis of the f1 score, which is used for cases of imbalanced partitioning, based on the fact that this problem generated imbalanced groups. To further develop the accuracy of depression detection, designers will develop more effective regression models in their future work.

In this project those are very helpful to complete our project. For people suffering from mental health problems, it may be helpful to be more efficient in their rapid recovery. Those papers are very effective for our project. I gathered the information from those papers. By implementing machine learning, major mental disorders such as depression can also be identified and solved. I thanked my teacher, because it helps me learn more.

References:

[1] L. He and C. Cao, "Automated depression analysis using convolutional neural networks from speech," *J. Biomed. Inform.*, 2018, doi: 10.1016/j.jbi.2018.05.007.

[2] A. Priya, S. Garg, and N. P. Tigga, "Predicting Anxiety, Depression and Stress in Modern Life using Machine Learning Algorithms," *Procedia Comput. Sci.*, vol. 167, no. 2019, pp. 1258–1267, 2020, doi: 10.1016/j.procs.2020.03.442.