

# Depression Detection from Text, Image & Speech using Deep Learning Algorithm

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*Abstract Depression is a serious illness that affects millions of people globally. From child to senior citizens are facing depression. Major area is occupied by adults, college going students and teenagers also. In recent years, the task of automatic depression detection from speech has gained popularity. However, several challenges remain, including which features provide the best discrimination between classes or depression levels. We provide a comparative analyses of various features for depression detection. Using the same corpus, we evaluate how a system built on text-based, audio-based and speech-based system. We find that a combination of features drawn from both speech and text lead to the best system performance. By doing a survey we have find most efficient algorithms for detection purpose. We have used CNN (Convolutional Neural Network) for Face images training, for Face recognition we have used Harr Cascade Algorithm. To detect depression using Text, we have used SVM(Support Vector Machine) Algorithm. Lastly for Audio input, we have used MFCC for speech recognition.*

*Keywords - Machine Learning, Face detection, Image preprocessing, segmentation, extraction, CNN, SVM, MFCC, Depression detection*

## I. Introduction

The aim of a study on "Depression Detection from Text, Image & Speech using Deep Learning Algorithm" involves employing deep learning techniques to develop a comprehensive methodology that can accurately detect signs of depression across multiple modalities.

Main motivation of this depression detection system is to detect depression symptoms in early stage of depression, so that person will get alert and take necessary action, consult doctor in early stage itself, so that later stages will be avoided, and last stage that is Suicide will get avoid. We want to create happy people with mental peace and avoid and detect depression

The main motivation of such research is to make the man-machine interface more flexible and more easy for the user. Depression is a common mental illness and a leading cause of disability worldwide, which may people are estimated to suffer from depression every year. Generally, depression is diagnosed through face-to-face clinical depression criteria. However, at early stages of depression, 70 percent of the patients would not consult doctors, which may take their condition to advance stages. Human experts will have privileged knowledge that codes the facial, text and audio features.

The primary objective is to develop a unified deep learning framework that amalgamates information from text, image, and speech modalities to detect and analyze markers indicative of depression. Specific goals include exploring multimodal feature extraction, designing multimodal fusion strategies, and training robust deep learning models capable of accurate depression detection.

- Collect diverse datasets containing textual content, images, and speech recordings from individuals with varying levels of depression and non-depressed individuals.
- Explore techniques for feature extraction and representation from text, image, and speech modalities that capture relevant patterns and indicators associated with depressive symptoms.
- Design and implement deep learning models, including multimodal fusion architectures or multimodal recurrent networks, capable of handling text, image, and speech data simultaneously.

## Literature Survey

Depression has become a serious problem in this current generation and the number of people affected by depression is increasing day by day. However, some of them manage to acknowledge that they are facing depression while some of them do not know it. On the other hand, the vast progress of social media is becoming their “diary” to share their state of mind. Several kinds of research had been conducted to detect depression through the user post on social media using machine learning algorithms. Through the data available on social media, the researcher can able to know whether the users are facing depression or not. Machine learning algorithm enables to classify the data into correct groups and identify the depressive and non-depressive data.

The proposed research work aims to detect the depression of the user by their data, which is shared on social media. The Twitter data is then fed into two different types of classifiers, which are Naïve Bayes and a hybrid model, NBTree. The results will be compared based on the highest accuracy value to determine the best algorithm to detect depression. The results shows both algorithm perform equally by proving same accuracy level. Depression has become a serious problem and affecting mental health. Depression is also considered an important illness that affected more than 264 million people worldwide [1]. There are many possibilities such as sudden changes of surroundings, changes in the brain’s neurotransmitter level due to some feeling attacks, or even genetic features [2]. Depression can be treated either by having a therapy session or medication. Even though many patients are undergoing the treatments there are still a high number of people who are undiagnosed cases of depression due to lack of knowledge of depression.

Consequently, patients will suffer from bad thoughts such as self-isolation, wild behavior, suicidal thoughts, and dependent on medicines such as antidepressant pills. Depression can slow down the daily activity performances due to a lack of focus and interest. Eventually, it can harm the body and brain of the individual if depression is not detected. Due to the advancement of technology, the number of social media users covers

approximately 3.8 billion people [3]. Evolvement and trendsetting of social media among people embrace the users to share their moods, thoughts, and opinion instantly.

Depression is a serious mental health issue for people world-wide irrelevant of their ages, genders and races. In this age of modern communication and technology, people feel more comfortable sharing their thoughts in social networking sites (SNS) almost every day. [4]. The objective of this paper is to propose a data-analytic based model to detect depression of any human being. In this proposed model data is collected from the users' posts of two popular social media websites: twitter and facebook. Depression level of a user has been detected based on his posts in social media. The standard method of detecting depression of a person is a fully structured or a semi-structured interview method (SDI) [5].

## iii. Proposed Method

### 3.1 Methodology:

In this project we are designing multimodal based deep learning and machine learning algorithms to detect depression from User Text Comment, Facial Expression Image and Speech Tones. In the past many algorithms were introduced to predict depression but all those algorithms were working on single data format like Text, Face or speech but not all.

Main intention of developing this application to detect user depression from all formats as humans are very sensitive and caring and will not show is depression to closed family member in order to avoid giving tension to them but often their depression can be identify either from face or his social media comments or in his speech. So we can detect depression in humans in all 3 multimodal format.

In propose work we deployed advanced deep learning algorithm called Convolution Neural Network (CNN2D) to detect depression from faces and voices. CNN consider best to classify data from images and speech. To identify depression from TEXT we employ Random Forest algorithm

as in ML Random Forest is most accurate compare to other algorithms.

To implement this project we have designed following modules

- 1) Upload Depression Dataset: using this module will upload all types of dataset to application and then read each format data in array format
- 2) Pre-process Dataset: this module we will apply pre-processing techniques like image, speech, and text data shuffling, normalization and then split them into train and test where application will be using 80% dataset for training and 20% for testing

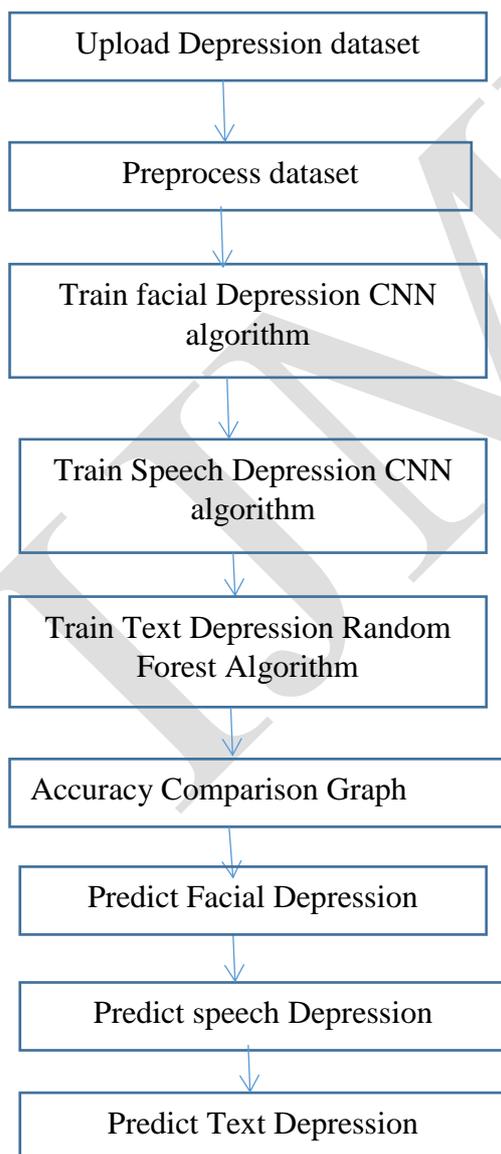


Fig.3.1 Flowchart

- 3) Train Facial Depression CNN Algorithm: this module will train CNN algorithm using facial images features and then trained a model and this model will be applied on 20% test images to calculate prediction accuracy
- 4) Train Speech Depression CNN Algorithm: this module will train CNN algorithm using speech features and then trained a model and this model will be applied on 20% test speech to calculate prediction accuracy
- 5) Train Text Depression Random Forest Algorithm: this module will train Random Forest algorithm using text features and then trained a model and this model will be applied on 20% test text features to calculate prediction accuracy
- 6) Accuracy Comparison Graph: using this module we will plot comparison graph between all algorithms
- 7) Predict Facial Depression: using this module will upload test image and then application detect weather facial features are depressed or non-depressed
- 8) Predict Speech Depression: using this module will upload test speech audio and then application detect weather test audio features are depressed or non-depressed
- 9) Predict Text Depression: using this module will upload test TEXT comments and then application detect weather test TEXT comments are depressed or non-depressed

RESULT



Fig.4.8 Performance of three Algorithms

In above graph x-axis represents algorithm names and y-axis represents accuracy and other metrics in different colour bar and in above graph can see all algorithms accuracy is more than 95% and now close above graph and then click on 'Predict Facial Depression' button to upload test image and get below output



Fig. facial features detected as depressed

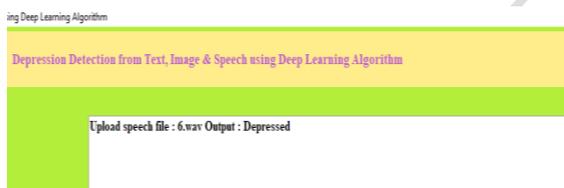


Fig.4.15 audio file detected as 'depressed'

In above screen audio file detected as 'depressed' and now click on 'Predict Text Depression' button to upload TEST TEXT comments like below screen

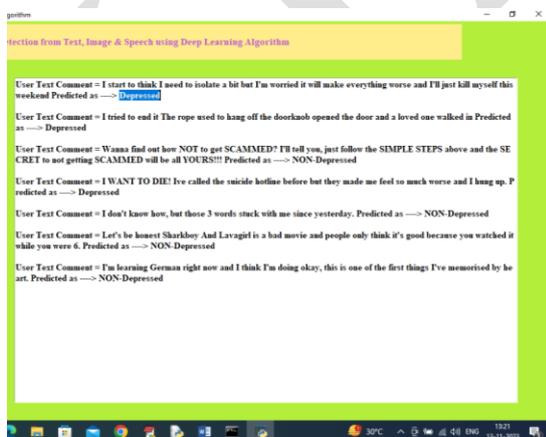


Fig.4 first displaying TEXT Comment

In above screen first displaying TEXT Comment and then after => symbol displaying predicted output as 'Depressed or Non-depressed'.

### CONCLUSION

In this project we have detected whether the person is depressed or not using Face, Text and Audio. We have used CNN (Convolutional Neural Network) for Face images training, for Face recognition we have used Harr Cascade Algorithm. To detect depression using Text ,we have used SVM(Support Vector Machine) Algorithm. Lastly for Audio input, we have used MFCC for speech recognition. The accuracy of Depression detection using Face is 88%. The accuracy of Depression detection using Audio is 89% while as the accuracy using Text is 87%.

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