

Video Based Depression Detection And Analysis

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ABSTRACT

Depression is one of the most serious and frequent diagnosed mental disorders. It affects not only the sufferers but also their families, friends and even the society in general. With rapid advancements in Artificial Intelligence and Machine Learning, there have been some new developments that aim to predict the strength of depression in an individual by analyzing certain parameters extracted from their video sample. This paper discusses some of the new and most worthy of note researches in the domain of depression analysis and balance their different frameworks like CNNs, RNN, etc. and algorithms used. The strength of depression is identified by using the Beck Depression Inventory-II (BDI-II) that range from 0 to 63. The performance of all these models is compared based on the structure (architecture and algorithms) assume and based on the MAE & RMSE scores obtained after testing them on AVEC 2013 & AVEC 2014 datasets. Apart from the comparative analysis, this paper also discusses a couple of approaches that study some unconventional parameters that scientific analysis in the task of depression detection and prediction from video data.

KEYWORDS: Depression analysis, CNN, BDI-II, AVEC, Comparative analysis.

I. INTRODUCTION

Depression is a mental health disorder that is generally characterized by frequent mood swings, loss of interest and pleasure, lack of concentration, varying sleep and appetite, feelings of low self-worth and more such similar symptoms [1]. Depression is a situation that most of the people nowadays are familiar with, either from a personal experience or through a person close to them, friend, family or a relative, who is suffering from it. Based on the reports by the World Health Organization (WHO) and the World Bank, depression is currently ranked as the major cause of disability throughout the globe [2]. The World Health Organization (WHO) has even gone so far as to predict that it will become the top physical or mental disorder worldwide by the year 2030 [3]. Recently, the treatment of depression disorders has progressed a lot and is proven to be effective in most of the cases. However, depression detection in an individual and accurately diagnosing it is still considered as a challenge and a barrier towards effective treatment. Detecting an individual to be suffering from depression is not an simple task. It is fully based on the individual reporting it, either by themselves or through a person close to them. It is rarely found that an individual is diagnosed accurately on the basis of a clinical judgement of symptom strength. Based on the analysis done by the World Health Organization (WHO), currently, there isn't any reliable and effective diagnosis of depression and it is mainly due to the overall lack of proper resources and trained health care providers [4]. With it becoming ever so important and an even more pressing issue, specific measures need to be taken to identify depression in an individual in its early stage and then, using suitable measures to treat the individual. Also, there have to be certain

measures that can prevent depression altogether. There has been a rapid upsurge in Artificial intelligence technologies and their use in various domains of life in the recent times. One such domain that is seeing massive changes due to AI advancement is healthcare. These AI techniques focus on obtaining detailed information for classification purposes[5].

II. PROBLEM STATEMENT

With a rise in mental health issues and cases throughout the world, it has now become a matter of major concern. The effects of depression are tremendous, both to the individual suffering from it and to the entire society as well. Depressive disorder (also called as depression) is a common mental disturbance. It assumes a depressed mood or loss of happiness or interest in activities for long periods of time. Depression is unlike from regular mood changes and feelings about everyday life. It can influence all aspects of life, as well as relationships with family, friends and community. It can result from or lead to difficulty at school and at work. Depression can occur to anybody. People who have lived through mistreat, severe losses or other stressful events are more likely to evolve depression. Women are more possible to have depression than men.

III. LITERATURE SURVEY

There have been some really extensive studies in this field of depression detection and prediction using Computer Vision and Deep Learning techniques. Here, we take a look at some of the most prominent and review them. Jan et al. in their paper have developed an artificial intelligence system that predicts the depression level based on visual and vocal features of an individual. The video data is first separated into visual and audio data, which are then separately analyzed. The features are extracted from the images either by using deep learning or various hand-crafted methods like LBP, EOH and LPQ. For extracting the features using deep learning, the video data for each sample is separated into various static image frames which are preprocessed individually. They are then passed forward into the deep network for high level feature extraction.

The model proposed by Melo et al. uses the ResNet-50 architecture along with an embedded expectation loss for distribution learning to predict the depression level of an individual. ResNet-50 architecture, which is basically a CNN model that is applied on each individual cropped-up face obtained from the input video data. It consists of a sequence of several convolutional layers, each of different dimensions. All the obtained features are summarized after the last convolutional layer by using a technique known as Global Average Pooling (GAP). Then, the classification of level of depression is carried out by the combination of the following components: a fully connected layer composed of 512 neurons, a softmax layer, and a probability distribution step to calculate the expected probabilities of every value (0-63) in the depression distribution. Finally, in order to predict the resultant depression score of the individual, the average of all predicted scores is calculated for every frame.

Jazaery & Guo, in their paper, have proposed a framework that uses a RNN-C3D based framework that models the local and global spatiotemporal features from a set of successive facial expressions, and then predicts the depression level. In videos that are used for depression analysis, the spatial features are the static appearances of the face in every consecutive frame and the temporal features are the dynamics (movements) of the individual's face and head [13]. The three dimensional convolutional network (C3D) contains features in both spatial and temporal dimensions and provides an output in three dimensions instead of the general two dimensional output vector. Hence, it is much more suitable for video based

data inputs since it can also learn based on the motion and dynamics encoded in the consecutive frames of videos and doesn't simply rely on individual frames as still images for the purpose of feature extraction. The Recurrent Neural Network (RNN) is basically used to model all the consecutive clips together and hence, to provide an overall better prediction result.

These are some of the most recent and the most noteworthy projects used for the task of depression analysis and prediction using deep Learning. Further, we take a look at some studies done that take a look at certain parameters that play a lead role in depression detection/ prediction to help us better understand all the vital factors that can be used in depression analysis.

IV. SYSTEM ARCHITECTURE

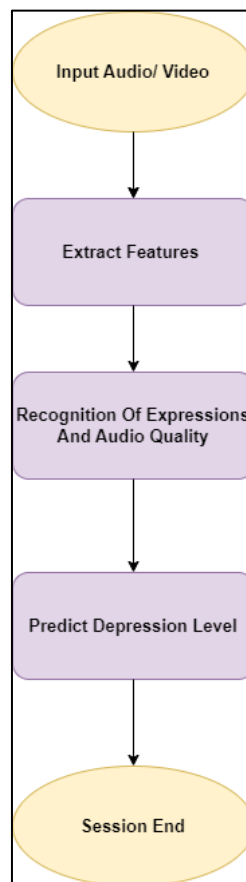


Fig.1 Video Based Depression Detection System Architecture

V. CONCLUSION

With a rise in mental health issues and cases throughout the world, it has now become a matter of major concern. The effects of depression are tremendous, both to the individual suffering from it and to the entire society as well. With a recent rise in Artificial Intelligence (AI) and Deep Learning technologies, it can be put to good use in the field of healthcare - to better detect and predict mental health issues such as depression early on and treat them before they can cause much harm. This paper takes a look at some of the recent attempts at automatic depression prediction among individuals from a video data of them using various deep learning technologies and methods such as CNN, RNN. It also discusses various architectures like VGG-Face, ResNet-50 that are used along with different algorithms for efficient analysis and more accurate predictions. The discussed methods, although quite remarkable, are just a

beginning for many more to come in this field of study, and they provide very promising results for future researchers to study in this domain and keep improving upon them.

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