

Stress Detection Using Machine Learning

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ABSTRACT

Stress management systems are essential to identify and address stress levels that can disrupt our socioeconomic functioning. According to the World Health Organization (WHO), one in four people experience stress, which can result in mental and socioeconomic issues, poor work relationships, and depression, and in severe cases, suicide. Counselling is crucial to help people cope with stress, and while stress cannot be avoided, preventive measures can be taken to mitigate its effects. Currently, only medical and physiological experts can determine whether someone is experiencing stress. Traditional stress detection methods rely on self-reported answers, which can be unreliable. Automated stress detection can minimize health risks and improve societal welfare. Therefore, there is a need for a scientific tool that can automate stress detection using physiological signals. Stress detection is an important social contribution that potential to improve quality of life. As IT industries bring new technologies and products to the market, stress levels in employees are also increasing. While some organizations offer mental health services to their employees, more needs to be done to address this issue.

Keywords: Machine Learning, Stress Detection, Haar Cascade algorithm, Convolutional Neural Network

INTRODUCTION

Stress is an inevitable part of our lives and refers to the uncomfortable state of emotional tension that individuals experience in various situations, such as extended periods of computer work. It is

essential watch closely the emotional state of someone who spends long hours in front of a computer to ensure their safety. One way to achieve this is by using a camera to capture a frontal view of the person as they work, with the camera mounted in front of them. The main motive of the said research is to improve the man machine interface to make it more user-friendly and flexible. In determining the age of a person, human experts have valuable knowledge about the facial characteristics that change with aging, including skin texture, face shape, lines, inflammation, and under-eye bags. However, this privileged knowledge is not available for test images in automated age estimation. To address this issue, we propose using asymmetric data to improve the generalize ability of the trained model. By exploring and exploiting this approach, we aim to enhance the accuracy and reliability of age estimation in automated systems.

LITERATURE REVIEW

A. Paper Name: *A Study and Comparison of Prediction Algorithms for Depression Detection among Millennials: A Machine Learning Approach network*

Author: Madhurima Hooda, Aashie Roy Saxena.

Depression is a significant problem that can have varying effects on people. Even though with availability of said research is to help individuals suffering from depression, the challenge lies in identifying those who may not even realize they are

experiencing depression. Multiple models have been developed to predict depression in individuals. This article provides a summary of three significant models: (a) the use of machine learning classifiers and WEKA, (b) imaging and machine learning techniques, and (c) risk factors. Depression can affect a person's physical and mental well-being and have various impacts on their quality of life, even if it is not severe. Numerous experiments have been conducted to analyze depression, and the three primary methods were analyzed to determine the most accurate approach. To determine the best method, several factors were considered, such as machine learning classifiers, feature reduction techniques, cross-validation methods, and risk factors. The Bayesnet Classifier for the Percentage Split testing option was found to be the most consistent method. Various datasets were utilized to evaluate the performance of the predictive model. As research in this field continues to evolve, alternative methods may be explored to enhance the accuracy of depression prediction.

B. Paper Name: *Detection Possibilities of Depression and Parkinson's disease Based on the Ratio of Transient Parts of the Speech.*

Author: Gábor Kiss, Artúr Bendegúz Takács, Dávid Sztahó, Klára Vicsi

The process of producing speech is a complex one that involves the brain and can be affected by neurological or psychological disorders such as depression and Parkinson's disease. Those with these conditions may experience slower speech, poor articulation, and a monotonous tone. A recent study aimed to investigate the impact of depression and Parkinson's disease on the ratio of transient parts (RoT) in speech, which refers to the significant and rapid changes in speech. The research analyzed 321 speech samples from individuals with no known health issues, individuals with depression, and those with Parkinson's disease to calculate the RoT using an automatic detection method for transient

parts. The findings showed that the mean value of RoT decreased by 9-10 speakers for those with Parkinson's disease, and the RoT was used with an 81 percent accuracy rate to differentiate between healthy and non-healthy speakers. People suffering from neurological disorders can have difficulties with articulation, particularly co-articulation, which is an essential aspect of the speech process. This impairment may impact the length of transient parts in their speech compared to healthy individuals. The research examined 190 speech samples from healthy individuals, 55 from depressed individuals, and 76 from individuals with Parkinson's disease. The analysis revealed that the mean value of RoT was lower in non-healthy speakers, indicating a distinct speech pattern compared to healthy individuals.

C. Paper Name: *Clinical Depression Detection in Adolescent by Face*

Author: Prajakta Bhalchandra Kulkarni, Minakshee M. Patil

Depression is a widespread illness that poses a significant threat to the lives of many individuals worldwide. According to the World Health Organization's 2017 report, approximately 300 million people were affected by depression globally. In India, the percentage of adolescents struggling with depression ranges from 0.3 to 1.2, which can have harmful effects on their lives. Various factors can trigger depression, such as the loss of a loved one or stress. Persistent symptoms of depression, such as social isolation, suicidal thoughts, and mental disturbances, can have severe consequences. Early detection of depression is essential in preventing its progression to more severe stages. In this paper, the authors propose a safe, simple, and reliable method for detecting depression without the need for a psychiatrist's assistance. The authors utilized two algorithms, namely the Fisher vector algorithm and LTrP, for depression detection. The Fisher vector algorithm is used to represent and describe an image,

using the Gaussian mixture model (GMM). It encodes the Fisher vector efficiently even with a linear classifier, giving the best results. The authors applied these algorithms to a face, and for feature extraction, they used LTrP. LTrP uses a central pixel as a reference to generate magnitude and tetra patterns with its neighboring pixels. To achieve limitations of the bag-of-words and local binary pattern methods, the LTrP method offers better results. The method classifies the person as "Depressed" or "Not depressed."

D. Paper Name: *Multimodal Spatiotemporal Representation for Automatic Depression Level Detection*

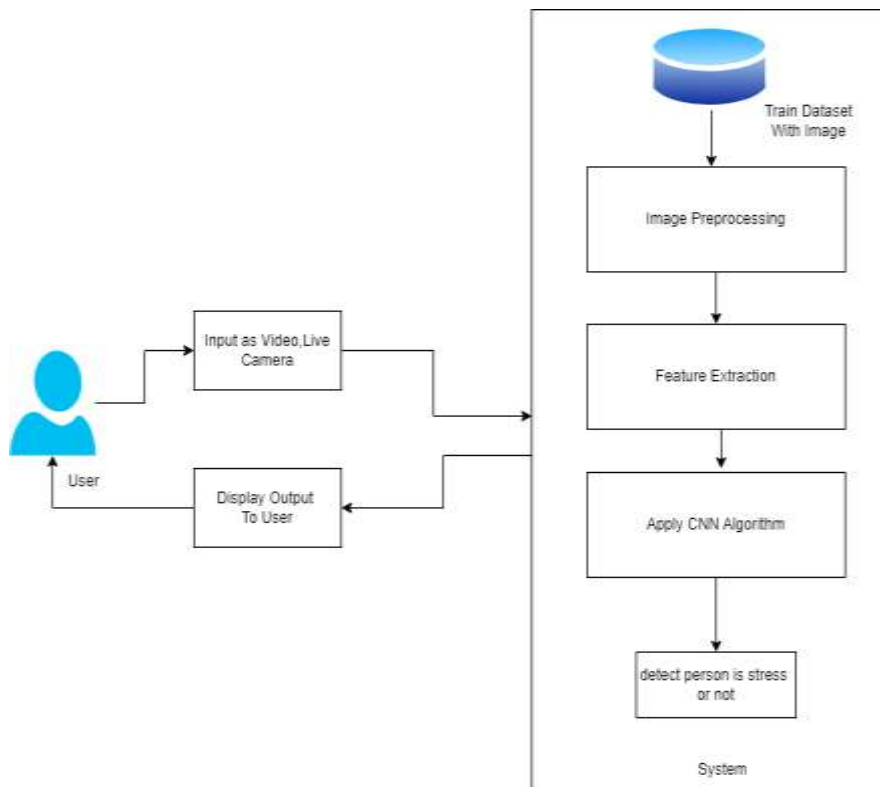
Author: Mingyue Niu, Student Member, IEEE, Jianhua Tao, Senior Member

Physiological research has shown that there are differences in speech and facial activities between individuals who suffer from depression and those who do not. In order to improve the prediction of depression levels using multiple cues, the

authors have introduced a new method called the Temporal Attention (STA) network and Multimodal Attention Feature Fusion (MAFF) strategy. The method divides the speech amplitude spectrum or video into segments of fixed length, which are then fed into the STA network. The STA network combines temporal and spatial information using an attention mechanism that highlights audio/video frames that are important for detecting depression. The eigen evolution pooling method is then used to summarize changes in each dimension of the audio/video segment-level features and combine them into audio/video level features. The MAFF strategy is used to generate additional information using multimodal representations that are then fed into the support vector regression predictor to estimate the severity of depression. The efficacy of this approach is demonstrated through experimental results obtained from the AVEC2013 and AVEC2014 depression databases.

MATERIALS & METHODS

A. System Architecture:



B. Proposed Approach:

This project can be implemented in following steps:

1. Preprocessing: -

This module involves the use of a machine to process a given input. During preprocessing, the machine is trained on the dataset and eliminates any unwanted parts of the input. Additionally, the dataset is resized as necessary to optimize the processing of the input data.

2. Feature extraction: -

The process of feature extraction involves converting raw data into numerical features that can be processed while retaining the original data's information. Utilizing feature extraction generally produces more accurate results than applying machine learning algorithms directly to raw data sets.

3. Classification: -

The CNN algorithm is used to classify the user testing value with the train data-set and determine if the given input indicates depression in the person. Machine learning is utilized to increase the accuracy of the prediction.

C. Algorithm:

- Convolutional Neural Network (CNN): The convolutional neural network is used as it is very accurate in image recognition and classification. It is also efficient and takes less computation time. In our case, we used the algorithm to identify the user's face and clearly classify the expressions in real time. CNN is useful in real time applications and processes the image to classify it in the given category. It is trained using supervised learning methods to recognize the patterns and classify accordingly. We used labeled data to train the model to recognize the person's expressions like angry, happy, neutral, sad, fearful and others. CNN recognizes the expression through real time input and classifies accordingly. Due to these advantages the CNN model is used and implemented successfully.

- Haar cascade Algorithm:

The Haar cascade is an efficient algorithm for identifying objects from a given image. It finds its use because of its ease and simple execution. This algorithm can be used on low end devices, with less computation and works in real time. The said algorithm runs smoothly with OpenCV python library, hence included in the project. It makes use of a function called the cascade function along with a cascading window for calculating features for window and classifying as positive or negative. It is positive when the window is part of the object, and it is negative if the window is not a part of the object.

CONCLUSION

Stress has recently been part of our lives, which is an unpleasant state of mind and emotional arousal that individuals experience in situations where there are challenges or unfavorable events. So, to monitor such a state of a person who is working in front of a computer device for longer duration is very crucial for their well-being. The Stress detection system will help monitor the stress levels of the given individual and help the individual in managing stress levels by real time updates through mails. This will spread awareness regarding mental health and to manage or reduce stress during longer working periods.

Declaration by Authors

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