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Depression Analysis Using Face Recognition System

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Abstract

Stress is a part of life it is an unpleasant state of emotional arousal that people experience in situations like working for long hours in front of a computer. Computers have become a way of life, much life is spent on computers and hence we are therefore more affected by the ups and downs that they cause us. One cannot just completely avoid their work on computers but one can at least control his/her usage when being alarmed about him being stressed at a certain point of time. Monitoring the emotional status of a person who is working in front of a computer for a longer duration is crucial for the safety of a person.

In this work, a real-time non-intrusive videos are captured, which detects the emotional status of a person by analyzing the facial expression. In each frame of the video, we identify a distinct emotion and assess stress levels over consecutive hours of captured footage. Our approach involves employing a methodology enabling model training and analysis of predictive variances. Utilizing Theano, a Python framework, we enhance both execution and development times for the linear regression model, serving as the deep learning algorithm in this context. Experimental findings indicate that our system effectively performs across diverse age groups with a generic model.

I. INTRODUCTION

In this study, we present a stress detection system centered on facial expression analysis. The system operates non-intrusively and offers real-time functionality. Utilizing a camera, we capture a near frontal view of individuals as they work in front of a computer. Positioned facing the person, the camera divides the captured video into three equal sections, from which an equal number of image frames are extracted for analysis. Key to this analysis is measuring the variation in eyebrow position relative to its mean. This involves scanning the images for eyebrow coordinates and calculating the displacement from the average position. Stress detection decisions are then made based on consecutive sections of previously segmented time intervals where stress is identified in the person. Leveraging deep learning, a subset of machine learning, we further analyze the obtained results. Theano, a Python framework, plays a crucial role in enhancing both the execution and development efficiency of the linear regression model employed as the deep learning algorithm in this context.

II. LITERATURE SURVEY/BACKGROUND

The surge in global mental health disorders has raised significant concerns, with a growing number of depression cases having profound impacts on both individuals and communities. With the recent advancements in Artificial Intelligence (AI) and Deep Learning technologies, there is potential to leverage them effectively in healthcare, aiding in early recognition and anticipation of mental health conditions like depression, thus enabling timely intervention to mitigate harm. According to a study, facial-based automatic recognition systems prove valuable in detecting emotions, including depression. The system proposed in this study entails three main steps: preprocessing, feature extraction, and classification. It considers five distinct facial expressions - Happy, Angry, Surprise, Neutral, and Fear. Initially, if frontal features were identified, feature extraction ensued; otherwise, Gaussian filtering was applied to eliminate noise before extraction. Neural networks were then employed for classification tasks. Logarithmic Gabor filters were applied post feature extraction, followed by selection of an optimal subset of features for each expression, facilitating accurate classification. The Facial Action Coding System (FACS) was utilized for emotion recognition and classification by encoding human facial expressions based on their appearance. Various facial movements were examined, assigned action codes, and utilized for emotion recognition. The YALE facial expression database was referenced. The proposed system efficiently employed FACS concepts, utilizing skin mapping, pattern matching, and local facial features to accurately recognize and classify human emotions. Videos were initially converted into frames using the MATLAB `VideoReader()` function. Emotion recognition involved multiple steps such as image acquisition, preprocessing, face detection, cropping, segmentation, morphological processing, masking, and mouth area calculation, with emotions predominantly classified based on mouth regions. The Viola-Jones algorithm was employed for facial region detection, and the proposed system was tested on video frames, successfully identifying emotions like Neutral, Smile, and Cry based on the filled mouth region of a child across 810 frames. The system comprises three primary steps: face detection, extraction of key features, and emotion classification based on these features, with trained neural networks utilized for face detection and various feature extraction and classification techniques employed, including PCA, Gabor Filters, SVM, and K-means clustering.

III. PROPOSED WORK/SYSTEM

The proposed system integrates facial recognition techniques with machine learning algorithms for depression analysis. It involves the following steps:

Data Acquisition: Utilize a database of facial images representing individuals with varying degrees of depression and non-depressed individuals.

Preprocessing: Apply preprocessing techniques to enhance image quality and remove noise, including skin segmentation and normalization.

Feature Extraction: Extract relevant facial features associated with depression, such as facial expressions, gaze patterns, and head movements.

Machine Learning Model: Train a machine learning model using the extracted features to classify individuals as depressed or non-depressed.

Depression Analysis: Analyze facial images of users in real-time to assess their depression levels based on the trained model.

Feedback and Intervention: Provide feedback to users based on the analysis results and recommend appropriate interventions, such as counseling or therapy.

IV. RESULT AND DISCUSSION

Depression is a severe psychiatric condition, and the current diagnostic procedure still requires a medically qualified physician or psychologist, who may use a scale and close observation of conversation, depending on the doctor's expertise. And it is difficult to diagnose and treat depression by non-psychiatrists. Capturing videos, including the eyes and faces, extracting and recognizing the captured videos can help patients or community physicians to detect, diagnose, or improve diagnosing depression at an early stage. In future research this is expected to be achieved.

V. CONCLUSION

The stress Detection System is designed to predict the stress of a person by monitoring captured images of authenticated users which makes the system secure. The image capturing is done automatically when the authenticated user is logged in based on some time interval. The captured images are employed to assess the user's stress levels using standard conversion and image processing techniques. Then the system will analyze the stress or not by using Machine Learning algorithms which generate the results that are more efficient.

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