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STRESS DETECTION USING MACHINE LEARNING TECHNIQUE

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***Abstract*—Stress is a most common source of physical and mental health issues that can effect our lives in various ways. Tenser Flow, Open CV and NumPy are powerful libraries that can be used to detect ,analyze and manage stress. Tenser Flow can be used to create and stress detection models , while Open CV and NumPy can be used to extract and analyze the facial expressions and body language to identify the signs of stress. These libraries can also be used to create personalized stress management plans based on a person's individua; needs, as well as to identify stress and suggest ways reduce their impact .With these tools ,it is possible to detect and analyze,**
manage stress, providing people with the resources they need to improve their mental and physical health more accurately.

Index Terms—*Open CV, Tenser Flows, NumPy.*

I. INTRODUCTION

Stress is the most common problem in the today's world and everyone suffers from it at some point in their lives. Stress can last for a short or long period of time, but it has a mental impact and can lead to a variety of health problems. The surprising result that approximately 86% of Chinese employees are stressed at workplace it is the world record. Individuals over the age of 72 have the lowest level of stress. These reports show how the country will be in the future, with nearly 25% of people experiencing stress during the holidays. Generally, Stress is divided into four categories: acute stress, episodic acute stress, chronic acute stress, and posttraumatic stress. Acute stress generally occurs when there are serious burn accidents, severe motor accidents, or assault-related traumas. These Acute stress levels only last for a short time, up to 1-2 days. Episodic acute stress is a type of stress that is experienced in short bursts on an irregular basis. It usually involves a single event or situation, such as a traumatic experience, that causes intense stress. This type of stress can be particularly difficult to manage because it is often unpredictable and can be difficult to anticipate.

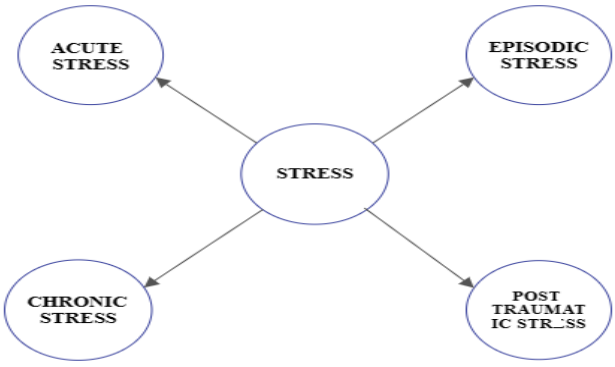


Fig-1.1

Chronic stress is a term used to describe the mental and emotional strain that builds up over long periods of time due to a variety of life circumstances. It is different from acute stress, which is a short-term reaction to a specific event. Post-traumatic stress disorder (PTSD) is a mental health condition that is triggered by experiencing or witnessing a traumatic event. It can cause intense fear, anxiety, and other emotional and physical reactions. Symptoms of PTSD can include flashbacks, nightmares, intense distress when reminded of the traumatic event, avoidance of situations that remind of the event, and feelings of isolation, guilt, and fear.

Based on the stress types classified above, we evaluate the user's stress using a machine learning technique because machine learning detects stress in real time for a large number of people with high accuracy. The main methods we are using in this project's development are eyebrow detection, blink detection, and real-time face emotion recognition. Eye blink detection generally counts the number of eye blinks from the user in a real time with high accuracy

in specific period of time, and if the eye blinks are greater than the threshold value of the normal eye blink of the human eye, we evaluate whether the user can be stressed or not. Real-time face emotion recognition generally identifies the node points in the face and compares those node points with the FER-2013 dataset (a set of images that classify the different emotions of the human face). Based on that, we evaluate the user's stress. Eyebrow detection generally detects the user's eyebrows and compares them with the mean position of the eyebrows on the natural human face. Based upon the eyebrow displacement difference, we evaluate the stress level of the user.

I. PREVIOUS METHODS

Decision tree, native byes and K-nearest neighbour:

Check heart rate, pulse value and galvanic skin response in hand and measure those values and compare with threshold values using decision tree, k-nearest neighbour.

2) Using ECG (Electro cardiogram) test with the SVM (SUPPORT VECTOR MACHINE):

Based up on the heart rate values given by the ECG of the user, SVM classifies the stress level of the user about the user is stressed or not.

3) ***Stress detection using NLP (natural language processing) and sentiment analysis:***

Identify the user recently posted posts in social media and in user digital diaries and analysis those posts using natural processing and classify the output with the sentiment analysis (whether positive text or negative) based up on that the output will be stressed or not stressed.

4)*Heart rate variability (HRV), along with the Skin temperature, decision tree:*

Measures heart rate and skin temperature values of the user and compare those values with the threshold values of normal human being heart rate and skin temperature and decide decision (whether stressed or not) with decision tree algorithm.

II. PROPOSED METHOD

Actually, we are following three methods in one structure, that is, in a single project. The user can use any of these three methods. The reason why we are implementing 3 methods is that each method shows highly accurate results, and the most perfect result can be chosen by the user based upon their keen interest. If one has a problem with the eyes, they go with the eyebrows, and if they have issues with the eyebrow structure, they go for total facial emotion recognition. If one fails, there is an alternative method for detecting stress in an efficient manner. The following three methods are..

1. **Eyeblink Detection**
2. **Eyebrow Detection**
3. **Face Emotion Recognition**

Eyeblink Detection:

Eye blink detection method, which generally counts the number of eye blinks of a user. Eye blink for a normal person is generally 15-20 times per minute, but in the case of a stressed person, eye blink is gradually greater than 20 times per minute. We also calculate the Eye Aspect Ratio (EAR), which is generally a numerical value when the eye is open and tends to zero when the eye closes.

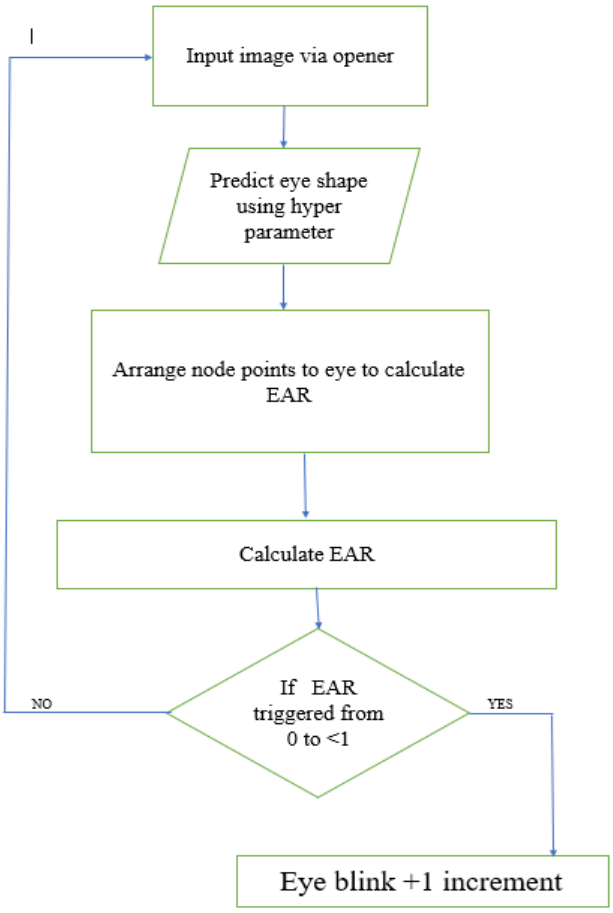


Fig-1.2

Actually, we grab the live input image from the user using open computer vision (OpenCV) library and predict eye shape of the taken live image using hyperparameters. after that we arrange node points around eye structure and calculate Eye Aspect Ratio using formulae mentioned below using NumPy, Eye aspect ratio generally useful to calculate count of eye blink if the eye aspect ratio raise from 0 to <1 then there is a eyeblink detected and eye blink count will be increased(for closed eye the aspect ratio is zero for open eye the aspect ratio is >0) if the value raise from 0 to some value then eye blink will done definitely based upon designed algorithm.

Fig-1.3

$$EAR = \frac{|P2 - P6| + |P3 - P5|}{2|P1 + P4|}$$

After the successful counting of the number of eye blinks using the machine learning algorithm mentioned above, we take the number of eye blinks per minute and compare it with the normal human eye blinks per minute. Based on the comparison of the values with the threshold value, we determine whether the person is stressed or not.

Eyebrow detection:

Even though eyebrows are relatively more stable across changing facial expressions, they can aid in the detection of the remaining facial features. Existing brow detection algorithms in the literature require complex computations and are therefore unsuitable for direct porting to embedded platforms.

We detect a user's eyebrow by capturing a live input image with the OpenCV library and using hyper parameters in the NumPy library we detect the eyebrow's structure. Every person's eyebrow structure is different; stressed people exhibit different facial expressions and have different eyebrow structure.

We identify the user's left and right eyebrows and compare them to the average position of the user's eyebrow in normal form. The average person has about 250 hairs per eyebrow. The thicker the brows, the easier the job to detect the eyebrow more efficiently and it leads to detect more accurate results, because the thickness of the eyebrows generally increases the detection rate efficiently.

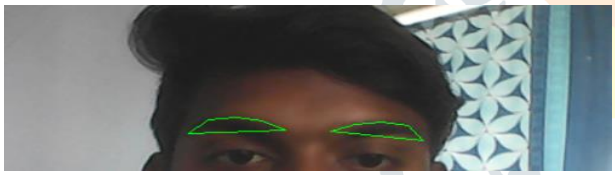


Fig-1.4

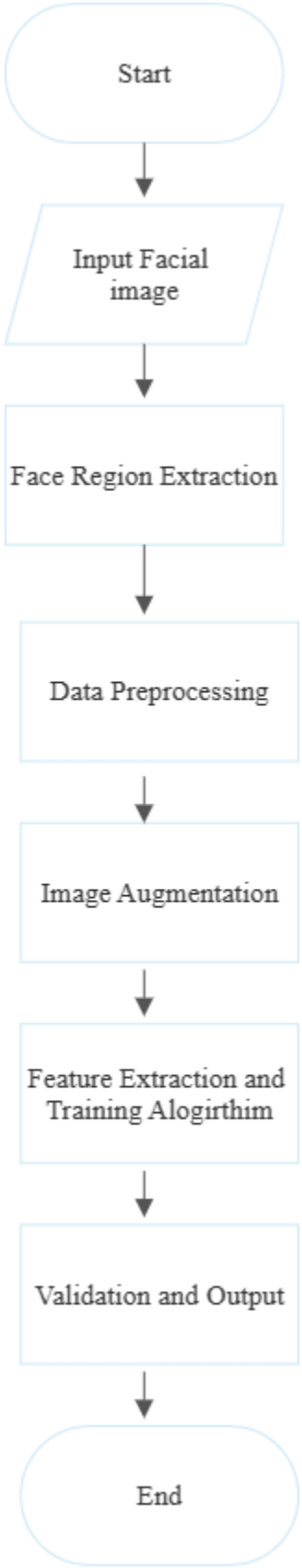
The above is the our eyebrow detection mechanism, we generally calculate stress level by measuring the contraction and displacement of the brows from their normal position. The distance between the left and right brow is calculated, and the stress level is normalized between 1 and 100 using an exponential function.

Face Emotion Recognition:

Facial emotion recognition generally involves predicting the stress level of the user by considering all eye, eyebrow, and facial structures. This method generally works with the help of a dataset, which produces highly accurate results. This method's output accuracy typically ranges between 68 and 70%.

In general, we take the user's input face and extract the face region, along with facial component extraction, and compare those schematic structures with the dataset to produce each emotion (sad: 10%, happy: 20%, angry: 25%...) and we specify everything about the facial emotion structure.

Overall Face Recognition Process:



Training, testing, and validation are critical steps in the machine learning workflow. A separate dataset is required for each step. As a result, the entire dataset is divided into the following sections. Training validation and testing these will gradually produce the accurate results.

DATASET DESCRIPTION:

We are actually using the fer2013 dataset, which contains the huge samples of emotion classifiers, based on the input image provided the developed algorithm produces the best

accurate results. The data consists of 48x48 pixel grayscale images of faces. The expressions on the faces have been classified into one of seven categories (0-Angry. 1 -Disgust. 2-Few, 3-Happy, 4-Sad. 5-Surprise, 6-Neutral) . There are a total of 28.709 examples in the training set. The public test set for the leaderboard has 3.589 examples. The final test set for determining.

The file fer2013.csv contains three columns: emotion, pixels, and purpose. First, the pixel column is saved in a list format because computing pixel values in the range of (0-255) is computationally complex, the data in the pixel field is normalized to values between [0-1]. The stored face objects are reshaped and resized to the specified size of 48 X 48. Objects store the respective emotion labels as well as their pixel values .

We split the dataset into training and testing data using scikit-train test split() learns function. The test size of 0.2 means that 20% of the data will be used for validation and 80% will be used for training.

Numerous OpenCV and Kera's functions were tested during the validation phase. The video frame is initially stored in a video object. With the help of NumPy, the image frame is converted to grayscale and resized and reshaped. This resized image is used to feed the predictor, which is loaded using the keras.models.load model() function. The maximum argument is printed. This resized image is used to feed the predictor, which is loaded using the keras.models.load model() function.

The schematic results are highly accurate after successfully training the algorithm and test the output with multiple faces for greater accuracy. The results also vary depending on the camera quality and how much the user is facing the lightning. Because of the software, with a poor camera and poor lighting, the user will gradually get the different values of stress level classifying the each emotion(sad,happy,angry,surprise) with false results.

III. OUTPUTS:

A) **EYE BLINK DETECTION**:

Fig-1.5

Fig-1.6

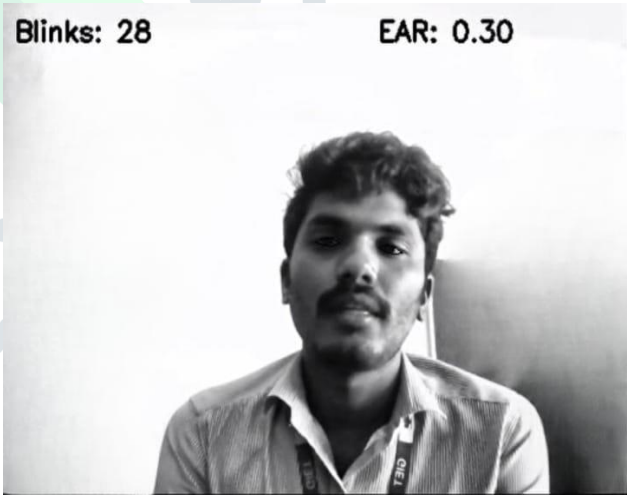


Fig-1.7

B)EYE BROW DETECTION :

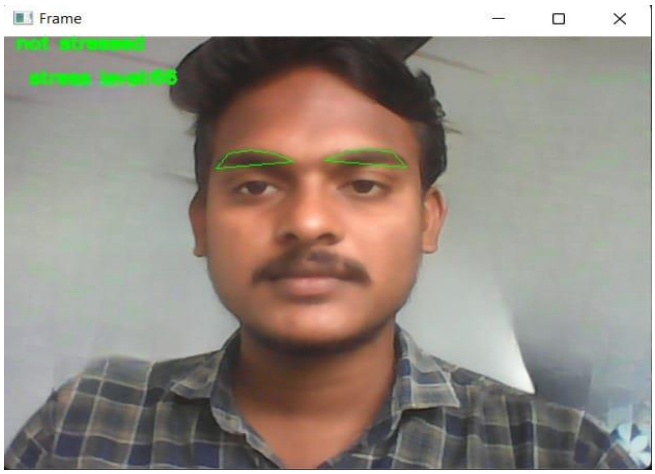


Fig-1.7

Fig-1.9 (Angry)

Fig-1.8

Fig-2.0 (Happiness)

C) FACE EMOTION RECOGNITION :

Fig-1.8 (scared)

Fig-1.9 (Surprised)

V) CONCLUSION :

We implemented this project based on three modules are Open CV, NumPy and Tenser flow using machine learning techniques. As the stress is the most important factor in human and we detect the stress in three ways are eye blink method detects the blinks of an eye and calculated the eye

aspect ratio, eyebrow detection detects the level of an stress and indicate the weather the person is stressed or not stressed, face emotion recognition detects the different emotions of an person like sad, angry, surprised ,disgust, happiness, neutral.

VI) FUTURE SCOPE:

In the future scope we detect the stress of a multiple persons At a time and levels of an stress and sends a message or mail to the persons regarding the stress level.

VII) REFERENCES:

[1] Dharan, "Machine Learning Techniques for Stress Prediction in Working Employees," Madurai, 2018 IEEE International Conference on Computational Intelligence and Computing Research (ICCIC), Madurai, India, 2018, pp. 1-4

[2] J. A. Healey and R. W. Picard, "Detecting stress during real-world driving tasks using physiological sensors," IEEE Transactions on Intelligent Transportation Systems, vol. 6, pp. 156-166, Jun 2005.

[3] "Detection of Stress Using Image Processing and Machine Learning Techniques," by Nisha Raichur, Nidhi Lanikai, and Priyanka Mural, vol.9, no. 3S, July 2017.

[4] Damian. Detecting Emotions in Text, https://data.world/damof/detecting-emotions-in-text. 2021.

[5] Akshada Kene, Subhadra Thakare, "Prediction of Mental Stress Level Based on Machine Learning", Machine Intelligence and Smart Systems, pp.525, 2022.

[6] Stress Detection with Machine Learning and Deep Learning using Multimodal Physiological Data -Pramod BobadeDepartment of Computer Science and Engineering, National Institute of Technology, Karnataka Surathkal, India. Vani M., Department of Computer Science and Engineering, National Institute of Technology, Karnataka, Surathkal, India.

[7] Detection and Analysis of Stress Using Machine Learning Techniques ReshmaRadheshamjeeBaheti, Supriya Kinariwala

[8] Stress Detection Using Natural Language Processing And Machine Learning Over Social Interactions Tanya Nijhawan1 , Girija Attigeri2* and T. Ananthakrishna1

[9] Stress Detection Using Machine Learning AlgorithmsV. R. Archana1, B. M. Devaraju2 1PG Student, Department of Computer Science and Engineering, RNS Institute of Technology, Bangalore, India 2Assistant Professor, Department of Computer Science and Engineering, RNS Institute of Technology, Bangalore, India.

[10] Dr. G V Gare, Apoorva Inamdar, Harsha Mahajan, “Stress Detection And Sentiment Prediction: A Survey”, International Journal of Engineering Applied Sciences and Technology, 2016.