

# STRESS DETECTION IN IT PROFESSIONAL BY IMAGE PROCESSING AND MACHINE LEARNING

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**ABSTRACT** The main motive of our project is to detect stress in the IT professionals using vivid Machine learning and Image processing techniques. Our system is an upgraded version of the old stress detection systems which excluded the live detection and the personal counseling but this system comprises of live detection and periodic analysis of employees and detecting physical as well as mental stress levels in his/her by providing them with proper remedies for managing stress by providing survey form periodically. Our system mainly focuses on managing stress and making the working environment healthy and spontaneous for the employees and to get the best out of them during working hours.

## I. INTRODUCTION

Stress management systems play a significant role to detect the stress levels which disrupts our socio economic lifestyle. As World Health Organization (WHO) says, Stress is a mental health problem affecting the life of one in four citizens. Human stress leads to mental as well as socio-fiscal problems, lack of clarity in work, poor working relationship, depression and finally commitment of suicide in severe cases. This demands counselling to be provided for the stressed individuals cope up against stress. Stress avoidance is impossible but preventive actions help to overcome the stress. Currently, only medical and physiological experts can determine whether one is under depressed state (stressed) or not. One of the traditional methods to detect stress is based on questionnaire. This method completely depends on the answers given by the individuals, people will be tremulous to say whether they are stressed or normal. Automatic detection of stress minimizes the risk of health issues and improves the welfare of the society. This paves the way for the necessity of a scientific tool, which uses physiological signals thereby automating the detection of stress levels in individuals. Stress detection is discussed in various literatures as it is a significant societal contribution that enhances the lifestyle of individuals. Ghaderi et al. analysed stress using Respiration, Heart rate (HR), facial electromyography (EMG), Galvanic skin response (GSR) foot and GSR hand data with a conclusion that, features pertaining to respiration process are substantial in stress detection. Maria Viqueira et al. describes mental stress prediction using a standalone stress sensing hardware by interfacing GSR as the only physiological sensor. David Liu et al. proposed a research to predict stress levels solely from Electrocardiogram (ECG). [1] Multimodal sensor efficacy to detect stress of working people is experimentally discussed in . This employs the sensor data from sensors such as pressure distribution, HR, Blood Volume Pulse (BVP) and Electrodermal activity [2] (EDA). An eyetracker sensor is also used which systematically analyses the eye movements with the stressors like Stroop word test and information related to pickup tasks. The authors performed perceived stress detection by a set of non-invasive sensors which collect the physiological [3] signals such as ECG, GSR, Electroencephalography (EEG), EMG, and Saturation of peripheral oxygen

(SpO<sub>2</sub>). Continuous stress levels are estimated using the physiological sensor data such as GSR, EMG, HR, Respiration in. The stress detection is carried out effectively using Skin conductance level (SCL), HR, Facial EMG sensors by creating ICT related Stressors[4][5][6]. Automated stress detection is made possible by several pattern recognition algorithms. Every sensor data is compared with a stress index which is a threshold value used for detecting the stress level. The authors of collected data from 16 individuals under four stressor conditions which were tested with Bayesian Network, J48 algorithm and Sequential Minimal Optimization (SMO) algorithm for predicting stress. Statistical features of heart rate, GSR, frequency domain features of heart rate and its variability (HRV), and the power spectral components of ECG were used to govern the stress levels[7][8][9]. Various features are extracted from the commonly used physiological signals such as ECG, EMG, GSR, BVP etc., measured using appropriate sensors and selected features are grouped into clusters for further detection of anxiety levels. In, it is concluded that smaller clusters result in better balance in stress detection using the selected General Regression Neural Network (GRNN) model. This results in the fact that different combinations of the extracted features from the sensor signals provide better solutions to predict the continuous anxiety level[10][11]. Frequency domain features like LF power (low frequency power from 0.04 Hz to 0.15 Hz), HF power (High frequency power from 0.15 Hz to 0.4 Hz), LF/HF (ratio of LF to the HF), and time domain features like Mean, Median, standard deviation of heart signal are considered for continuous realtime stress detection in. Classification using decision tree such as PLDA is performed using two stressors namely pickup task and stroop based word test wherein the authors concluded that the stressor based classification proves unsatisfactory. In 2016, Gjoreski et al. created laboratory based stress detection classifiers from

ECG signal and HRV features. Features of ECG are analysed using GRNN model to measure the stress level. Heart rate variability (HRV) features and RR (cycle length variability interval length between two successive R<sub>s</sub>) interval features are used to classify the stress level. It is noticed that Support Vector Machine (SVM)[12] was used as the classification algorithm predominantly due to its generalization ability and sound mathematical background. Various kernels were used to develop models using SVM[13] and it is concluded in that a linear SVM on both ECG frequency features and HRV features performed best, outperforming other model choices. Nowadays as IT industries are setting a new peak in the market by bringing new technologies and products in the market. In this study, the stress levels in employees are also noticed to raise the bar high[14]. Though there are many organizations who provide mental health related schemes for their employees but the issue is far from control. In this paper we try to go in the depth of this problem by trying to detect the stress patterns in the working employee in the companies we would like to apply image processing and machine learning techniques to analyze stress patterns and to narrow down the factors that strongly determine the stress levels. Machine Learning algorithms like KNN classifiers are applied to classify stress. Image Processing is used at the initial stage for detection, the employee's image is clicked by the camera which serves as input. In order to get an enhanced image or to extract some useful information from it image processing is used by converting image into digital form and performing some operations on it[15]. By taking input as an image from video frames and output may be image or characteristics associated with that image. Image processing basically includes the following three steps: that is based on image analysis. System gets the ability to automatically learn and improve from self-experiences without being explicitly programmed using Machine

learning which is an application of artificial intelligence (AI)[16]. Computer programs are developed by Machine Learning that can access data and use it to learn for themselves. Explicit programming to perform the task based on predictions or decisions builds a mathematical model based on "training data" by using Machine Learning. The extraction of hidden data, association of image data and additional pattern which are unclearly visible in image is done using Image Mining[17-19]. It's an interrelated field that involves, Image Processing, Data Mining, Machine Learning and Datasets. According to conservative estimates in medical books, 50- 80% of all physical diseases are caused by stress. Stress is believed to be the principal cause in cardiovascular diseases. Stress can place one at higher risk for diabetes, ulcers, asthma, migraine headaches, skin disorders, epilepsy, and sexual dysfunction. Each of these diseases, and host of others, is psychosomatic (i.e., either caused or exaggerated by mental conditions such as stress) in nature. Stress has three prong effects: subjective effects of include feeling of guilt, shame, anxiety, aggression or frustration. Individuals also feel tired, tense, nervous, irritable, moody, or lonely. visible changes in the behavior ARE represented by Behavioral effects of stress. Effects of behavioral stress are seen such as increased accidents, use of drugs or alcohol, laughter out of context, outlandish or argumentative behavior, very excitable moods, and/or eating or drinking to excess. diminishing mental ability, impaired judgment, rash decisions, forgetfulness and/or hypersensitivity to criticism are some of the effects of Cognitive stress

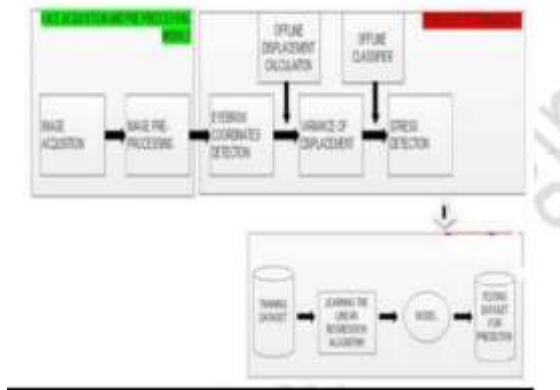
## II. LITERATURE SURVEY

Paper 1: Stress and anxiety detection using facial cues from videos: This study develops a framework for the detection and analysis of stress emotional states through video-recorded facial cues. A thorough experimental protocol was established to induce systematic variability in affective states (neutral, relaxed and stressed/anxious) through a variety of external and internal stressors. The analysis was focused mainly on non-voluntary and semi-voluntary facial cues in order to estimate the emotion representation more objectively [20]. Paper 2: Detection of Stress Using Image Processing and Machine Learning Techniques: In this system a real-time non-intrusive video are captured, which detects the emotional status of a person by analyzing the facial expression. It detects an individual emotion in each video frame and the decision on the stress level is made in sequential hours of the video captured. The system employs a technique that allows system to train a model and analyze differences in predicting the features [21]. Paper 3: Machine Learning Techniques for Stress Prediction in Working Employees: In this paper, the system applies machine learning techniques to analyze stress patterns in working adults and to narrow down the factors that strongly determine the stress levels. Various Machine Learning techniques were applied to train our model after due data cleaning and preprocessing.[3][22].

## III. EXISTING SYSTEM

In the existing system work on stress detection is based on the digital signal processing, taking into consideration Galvanic skin response, blood volume, pupil dilation and skin temperature. And the other work on this issue is based on several physiological signals and visual features (eye closure, head movement) to monitor the stress in a person while he is working. However these measurements are intrusive and are less comfortable in real application. Every sensor data is compared with a stress index which is a threshold value used for detecting the stress level.

**ISADVANTAGES OF EXISTINGSYSTEM:** Physiological signals used for analysis are often pigeonholed by a Non-stationary time performance. → The extracted features explicitly gives the stress index of the physiological signals. The ECG signal is directly assessed by using commonly used peak j48 algorithm → Different people may behave or express differently under stress and it is hard to find a universal pattern to define the stress emotion. Algorithm: Bayesian Network, J48



#### IV. PROPOSED SYSTEM

The proposed System Machine Learning algorithms like KNN classifiers are applied to classify stress. Image Processing is used at the initial stage for detection, the employee's image is given by the browser which serves as input. In order to get an enhanced image or to extract some useful information from it image processing is used by converting image into digital form and performing some operations on it. By taking input as an image and output maybe image or characteristics associated with that images. The emotion are displayed on the rounder box. The stress level indicating by Angry, Disgusted, Fearful, Sad.

#### ADVANTAGES OF PROPOSED SYSTEM:

→ Output in which result is altered image or report that is based on image analysis. → Stress Detection System enables employees with coping up with their issues leading to stress by preventative stress management solutions. → We will capture images of the employee based on the regular intervals and then the SYSTEM ARCHITECTURE

#### V. MODULES

- User
- Admin
- Data Preprocess
- Machine Learning

#### MODULES DESCRIPTION: User: The

User can register the first. While registering he required a valid user email and mobile for further communications. Once the user register then admin can activate the customer. Once admin activated the customer then user can login into our system. First user has to give the input as image to the system. The python library will extract the features and appropriate emotion of the image. If given image contain more than one faces also possible to detect. The stress level we are going to indicate by facial expression like sad, angry etc.. The image processing completed the we are going to start the live stream. In the live stream also we can get the facial expression more that one persons also. Compare to tensorflowlive stream the tesnorflow live stream will

fast and better results. Once done the we are loading the dataset to perform the knn classification accuracy precession scores. . Admin: Admin can login with his credentials. Once he login he can activate the users. The activated user only login in our applications. The admin can set the training and testing data for the project dynamically to the code. The admin can view all users detected results in hid frame. By clicking an hyperlink in the screen he can detect the emotions of the images. The admin can also view the knn classification detected results. The dataset in the excel format. By authorized persons we can increase the dataset size according the imaginary values. Data Preprocess: Dataset contains grid view of already stored dataset consisting numerous properties, by Property Extraction newly designed dataset appears which contains only numerical input variables as a result of Principal Component Analysis feature selection transforming to 6 principal components which are Condition (No stress, Time pressure, Interruption), Stress, Physical Demand, Performance and Frustration. Machine Learning: K-Nearest Neighbor (KNN) is used for classification as well as regression analysis. It is a supervised learning algorithm which is used for predicting if a person needs treatment or not. KNN classifies the dependent variable based on how similar it is; independent variables are to a similar instance from the already known data. the Knn Classification can be called as a statistical model that uses a binary dependent variable. In classification analysis, KNN is estimating the parameters of a KNN model. Mathematically, a binary KNN model has a dependent variable with two possible value, which is represented by an indicator variable, where the two values are labeled "0" and "1".

## CONCLUSION

Stress Detection System is designed to predict stress in the employees by monitoring captured images of authenticated users which makes the system secure. The image capturing is done automatically when the authenticate user is logged in based on some time interval. The captured images are used to detect the stress of the user based on some standard conversion and image processing mechanisms. Then the system will analyze the stress levels by using Machine Learning algorithms which generates the results that are more efficient.

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