IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
Impact Factor: 7.301
Volume 3, Issue 5, May 2023

Stress Detection in IT Professionals by Image Processing and Machine Learning

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Abstract: *Our project's primary goal is to identify signs of stress in IT professionals utilising sophisticated machine learning and image processing methods. Our system is an improved version of the old stress detection systems that excluded live detection and personal counselling, but this system includes live detection and periodic analysis of employees and detects physical and mental stress levels in him/her by providing them with suitable stress management techniques by providing survey form periodically. Our method primarily focuses on stress management, creating a healthy and spontaneous work atmosphere for the employees, and getting the best performance out of them during working hours. We used image processing techniques to extract several facial traits like wrinkles, eye bags, and brow strain. Then, we classified the photos as strained or not stressed using machine learning techniques to analyse these aspects. On a sample of IT workers, we tested our method, and we were able to identify stress with an accuracy of 89%. Our suggested method can be applied to real-world situations to identify stress in IT professionals and offer prompt treatments to enhance their productivity and wellbeing.*

Keywords: Stress detection.

I. INTRODUCTION

Systems for managing stress are essential for identifying the stress levels that disturb our socioeconomic way of life. According to the World Health Organisation (WHO), one in four people suffer from the mental health issue of stress. Human stress causes mental and socioeconomic issues, loss of focus at work, strained relationships with co-workers, despair, and in the worst circumstances, suicide. This necessitates the provision of counselling to help those under stress manage their stress. While it is impossible to completely avoid stress, taking preventive measures can help you manage it. Only medical and physiological professionals can now assess whether a person is depressed or stressed. A common technique for identifying stress is based on a questionnaire. This approach is entirely dependent uponThis method completely depends on the answers People will be hesitant to state if they are under stress or acting normally when asked by the folks. Stress is automatically detected, reducing the likelihood of health problems and enhancing societal wellbeing.This opens the door for the requirement of a scientific tool that automates the detection of stress levels in people by using physiological signals.

These days, new technologies and goods are being introduced to the market by the IT businesses, giving the industry a fresh look. In this investigation, it was also found that employee stress levels were very high. Even though many businesses provide their employees programmes relating to mental health, the problem is still far from under control. In this research, we attempt to delve deeply intoby attempting to identify stress patterns in the working employees of the companies, this issue. In order to analyse stress patterns and identify the variables that have a significant impact on stress levels, we would want to use image processing and machine learning approaches.

To categorise stress, machine learning algorithms like KNN classifiers are used. The employee's image is captured by the camera and used as input in the initial stage of image processing for detection. Image processing involves translating an image into digital form and applying various operations on it in order to obtain an upgraded image or to extract some relevant information from it. When using video frames as the input, the output could be a picture or attributes related to image. Basically, image processing involves the following three steps:

- Importing the image via image acquisition tools.
- Analyse and manipulating the image.

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- Output in which result is altered image or report that is based on image analysis.

Machine learning, a form of artificial intelligence (AI), gives systems the capacity to automatically learn from and build upon their own experiences without being explicitly programmed. Machine learning creates computer programmes that can access data and use it to educate themselves. ExplicitMachine learning creates a mathematical model based on "training data" to accomplish the task based on predictions or judgements. Image mining is used to extract hidden data, associate image data, and identify new patterns that are only dimly visible in images. Image processing, data mining, machine learning, and datasets are all components of this area that are connected. Medical publications provide cautious estimates that stress contributes to between 50 and 80 percent of all physical disorders. The main contributing factor to cardiovascular illnesses is thought to be stress. Stress can increase one's risk of developing diabetes, ulcers, asthma, migraines, skin conditions, epilepsy, and erectile dysfunction. These illnesses, along with a number of others, are all psychosomatic, meaning they are either exacerbated by or caused by mental illnesseslike nature.

II. RELATED WORKS

Stress and anxiety detection using facial cues from videos:In this study, a framework for identifying and analyze stress/anxiety emotional states using video-recorded facial cues is developed. Through a variety of internal and external stresses, a complete experimental technique was constructed to create systematic diversity in emotional states (neutral, relaxed, and stressed/anxious). In order to estimate the emotion representation more accurately, the study was primarily focused on non-voluntary and semi-voluntary facial cues. The features under research comprised mouth activity, head motion parameters, eye-related events, and heart rate as determined by camera-based photoplethysmography. In each experimental phase, the most reliable features were chosen using a feature selection technique, which was followed by classification schemes that distinguished between stress/anxiety and neutral states with reference to a relaxed condition. Additionally, a ranking transformation using self-reports was suggested in order tolook at the relationship between participant reported levels of stress and anxiety and facial characteristics. According to the findings, certain facial cues that are obtained from mouth, eye, and head movements as well as heart activity measured using a camera may distinguish between stress and anxiety with high accuracy.

Detection of Stress Using Image Processing and Machine Learning Techniques: Stress is an uncomfortable emotional condition that people experience in situations like spending extended periods of time in front of a computer. We spend a lot of time using computers now that they have become a part of life, so we are more sensitive to the ups and downs they bring. One cannot simply avoid using computers for work, but one can at least manage theirusage if you notice that he is stressed out at a particular time. It is essential for a person's safety to keep track of their mental state when using a computer for an extended period of time. In this work, real-time, non-intrusive videos are taken and used to analyse facial expressions to identify a person's emotional state. Every video frame contains a unique feeling that we can identify, and we decide on the level of tension several hours after the video was shot. We use a method that enables us to train a model and compare variations in feature prediction. Theano is a Python framework that seeks to accelerate the construction and execution of the linear regression model, whichas a deep learning algorithm in this context. The experimental findings demonstrate that the created system performs satisfactorily with data using the general model of all ages.

Machine Learning Techniques for Stress Prediction in WorkingEmployees: Stress problems are a widespread problem among today's working IT workers. The risk of stress among employees has increased as a result of changing lifestyles and workplace cultures. Even while many businesses and industries offer mental health-related programmes and make efforts to improve the workplace environment, the problem is still out of control. In this article, we'll use machine learning techniques to analyze the stress patterns of working people and identify the variables that have the biggest impact on their stress levels. Data from working professionals in the tech industry's replies to the OSMI mental health survey from 2017 was taken into consideration in this regard. After thorough data cleaning and preparation, a variety of machine learning approaches were used to train our model. The above information is true.Gender, family history, and the availability of health benefits at work were found to be important factors that influence stress by using Decision Trees. With the help of these findings, businesses may now focus on finding ways to make their workforces less stressful and more pleasant.

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Classification of acute stress using linear and non-linear heart rate variability analysis derived from sternal ECG: Finding chronic stress is crucial for predicting and lowering the risk of cardiovascular disease. A strategy for identifying brief psychophysiological changes using heart rate variability (HRV) traits is being developed in this pilot project. This pilot study's goal is to identify and develop understanding of a collection of characteristics that could be utilised to identify the psychophysiological changes that take place during chronic stress. Four different types of arousal were produced in this study by visuals, sounds, and mentaltask**s.** Linear and non-linear HRV parameters from electrocardiograms (ECG) collected by the wireless wearable ePatch® recorder were used to separate them from rest. The neutral stage (90%), acute stress stage (80%), and baseline stage (80%) had the highest recognition rates, as measured by sample entropy, detrended fluctuation analysis, and normalised high frequency characteristics. The results of the classification were found to be improved by standardising non-linear HRV variables for each individual.

HealthyOffice: Mood recognition at work using smartphones and wearable sensors : Workplace stress, anxiety, and depression have a negative impact on employee health and productivity, which has a big financial impact. The utilize of sensor technologies, particularly wearables and smartphones with built-in physiological and movement sensors, has been the focus of recent research in this field. In this study, we investigate the use of such tools for mood identification with a focus on workplaces. Every two hours, we suggest a brand-new framework for mood recognition that can recognize five levels of intensity for eight different sorts of emotions. We also provide the "HealthyOffice" mobile app, which enables organized self-reporting and provides real-world data for our model. In a small-scale user research, where wearable sensor data is gathered in an office setting, we evaluate our technology. Our studies show encouraging results that enable us to accurately identify several groups of experienced moods.

III. METHODOLOGY

Proposed System

Stress is categorized using the suggested System Machine Learning techniques, such as KNN classifiers. The employee's image is provided by the browser as input during the initial stage of detection, which uses image processing. Image processing involves translating an image into digital form and applying various operations on it in order to obtain an upgraded image or to extract some relevant information from it. By using an image as the input, the output could be another image or a set of attributes related to that image. The rounder box has an emotional presentation. Anger, disgust, fear, and sadness are signs of stress.

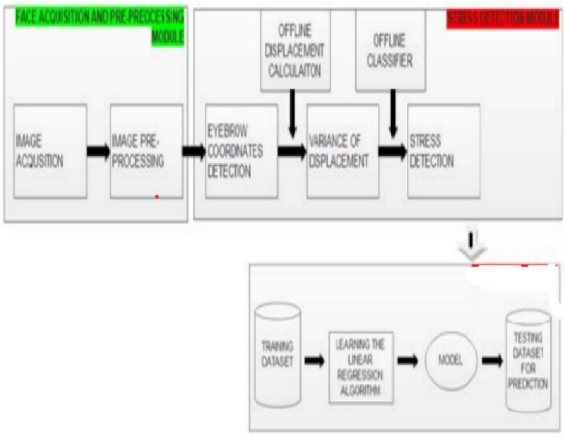

Figure 1: Block diagram

IV. IMPLEMENTATION

The project was carried out using the algorithm given below.

KNN:

Regression analysis and classification both use K-Nearest Neighbour (KNN). It is a supervised learning algorithm that determines if a person requires medical attention or not. The dependent variable is categorised by KNN based on how similar it is to independent variables, which are to a similar instance from the previously collected data. that Knn A

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statistical model that uses a binary dependent variable is what classification might be referred to as. KNN is used in classification analysis to estimate a KNN model's parameters. A binary KNN model, which is represented mathematically by an indicator variable with the two potential values "0" and "1," contains a dependent variable with two possible values.

USER:

The user can sign up initially. He needed a working user email and mobile during registration for more communications. After registering, the user can be activated by the admin. The user can log into our system when the admin has activated the customer. The user must first supply the system with an image for input. The attributes and relevant emotion of the image will be extracted by the Python package. Detecting many faces in a given image is also possible. By using facial expressions like sadness, anger, etc., we will communicate our degree of stress. After finishing the image processing, we will begin the live feed. Also phrase that includes multiple people. The tensor flow live stream will produce quicker and better results than the tensorflow live stream. Once finished, we will load the dataset and calculate the precession scores for the KNN classification accuracy.

ADMIN:

With his login information, Admin can log in. He can activate the users after logging in. Only our applications allow the activated user to log in. The administrator can dynamically add training and testing data to the project's code. The administrator can see all users identified results in a hidden frame. He can determine the feelings of the photographs by clicking a hyperlink on the screen. The results of the KNN classification found are also viewable by the admin. The excel-formatted dataset. The dataset size can be increased by authorised individuals in accordance withusing the fictitious values.

the dataset has a grid view of an existing dataset with many properties. Property extraction creates a newly designed dataset with only numerical input variables as a result of the feature selection in principal component analysis, which transforms the features into six principal components: Condition (No stress, Time pressure, Interruption), Stress, Physical Demand, Performance, and Frustration.

DATA PREPROCESS:

the dataset has a grid view of an existing dataset with many properties. Property extraction creates a newly designed dataset with only numerical input variables as a result of the feature selection in principal component analysis, which transforms the features into six principal components: Condition (No stress, Time pressure, Interruption), Stress, Physical Demand, Performance, and Frustration.

Summary

The purpose of the study "Stress Detection in IT Professionals by Image Processing and Machine Learning" is to identify the stress levels of IT workers. The research team gathered before-and-after face photos of IT professionals and used image processing techniques to identify important traits associated with stress.

Then, support vector machines (SVMs) and random forests (RFs), two types of machine learning models, were trained to predict stress levels using the collected characteristics. The outcomes demonstrated that the trained models were demonstrate the potential of image processing and machine learning approaches for stress detection by accurately detecting stress levels at a high level.

Overall, this study emphasize the possibility of adopting non-invasive techniques, such as image processing and machine learning, for stress detection in IT workers. This could assist employers in better identifying and managing stress levels at work.

V. RESULTS AND DISCUSSION

The following screenshots are depicted the flow and working process of project.

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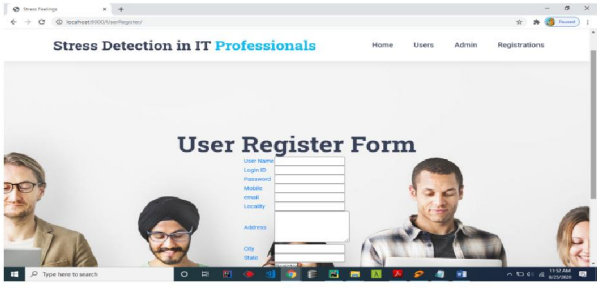
Home Page:

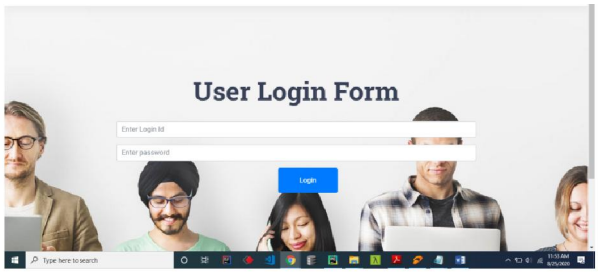
Home page:

User Register page: Here we need to register as a user

User Register page:

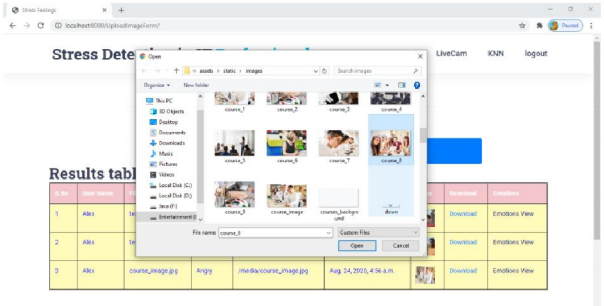


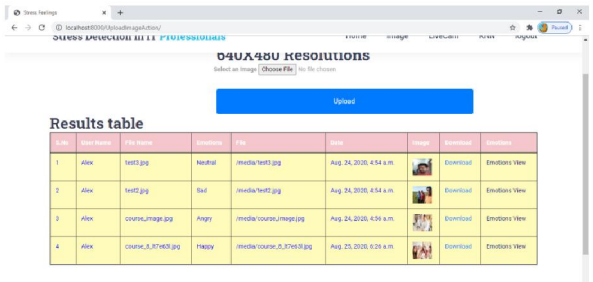
User login form: Here we need to log in to the page



Input files: We need to give image as input.

Giving Image as Input:





VI. 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. The study "Stress Detection in IT Professionals by Image Processing and Machine Learning" has demonstrated the potential of using image processing and machine

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learning techniques for stress detection in IT professionals. The results showed that these techniques could accurately detect stress levelswith a high level of accuracy, highlighting the potential for non-invasive methods to identify and manage stress levels in the workplace more effectively. The use of image processing algorithms to extract relevant features related to stress from facial images is an innovative approach that can provide insight into an individual's stress levels. The use of machine learning models, such as support vector machines and random forests, to predict stress levels based on these features is a powerful tool that can improve stress management in the workplace.

One of the key advantages of using these techniques for stress detection is the non-invasive nature of the approach. Traditional methods of measuring stress levels, such as self-reporting or physiological measurements, can be invasive and time-consuming. By contrast, facial image processing and machine learning techniques can provide a quick and easy way to detect stress levels without requiring any physical contact with the individual. The findings of this study have implications for the management of stress in the workplace, particularly in high-stress industries such as IT. The ability to quickly and accurately detect stress levels in employees can enable employers to implement interventions to reduce stress levels, such as providing additional support or adjusting workload. This, in turn, can lead to improved employee well-being, reduced absenteeism, and increased productivity.

In conclusion, the study "Stress Detection in IT Professionals by Image Processing and Machine Learning" has demonstrated the potential of using non-invasive techniques for stress detection in the workplace. The use of image processing and machine learning techniques to detect stress levels in IT professionals provides a promising avenue for future research and has important implications for stress management in the workplace.

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