DETECTION OF STRESS IN IT EMPLOYEESBY USING IMAGE CLASSIFICATION AND MACHINE LEARNING

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Abstract— The motto of our project is detecting stress in IT employees using image classification and the k-Nearest Neighbor (KNN) algorithm. The proposed system captures facial images of employees and processes them to identify signs of stress such as changes in facial expressions. The images are preprocessed and the features are extracted, the extracted features are then used to train and test a KNN classifier that can accurately classify the employees into stressed or non-stressed categories. The proposed approach was evaluated using a dataset of facial images collectedfrom IT employees, and the results show that the KNNalgorithm can effectively detect stress in IT employees with a high degree of accuracy. The proposed system can be used by employers to monitor the stress levels of their employees, leading to a healthier and more productive work environment.

Keywords—Image processing, machine learning,

Stress detection

I. INTRODUCTION

Understanding the stress levels that disrupt our socioeconomic way of life is crucial for developing effective stress management systems. According to the previous researches, one in four people suffers from the mental health issue of stress. Human stress causes mental and socioeconomic issues, loss of focus at work, strained relationships with coworkers, despair, and in the worst circumstances, suicide. This necessitates the provision of counseling to help those under stress manage their stress. Although 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.

People will be hesitant to say whether they are under stress or acting normally because this strategy depends entirely on the responses provided by the individuals. 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. Several literary works tackle stress detections since it significantly improves people's quality of life and contributes to society. Ghaderi et al. concluded that features related to respiratory process are significant in stress identification after analyzing stress utilizing breathing, heart rate (HR), electromyography (EMG) of the face and data from the feet and hands using GSR. A study topredict stress levels only from electrocardiograms was proposed by David Liu and colleagues (ECG). Experimentally examined is the effectiveness of multimodal sensors to identify worker stress. Additionally, an eye tracker sensor is employed analyze the eye movements in relation to stressors like the Stroop word test and data from pickup tasks. The scientists used a collection of non-invasive sensors to measure felt stress using physiological signals like ECG, GSR, Electroencephalography (EEG), EMG, and peripheral oxygen saturation (SpO2). Sensor information from of the Drg, Plm, and HR and respiration in used to assess continuous stress levels. Anxiety can be effectively detected using face Emf monitors, pulse rate (HR), and galvanic skin level (SCL) sensors.

Several pattern recognition methods enable automated stress detection. A stress index, a cutoff point for estimating the level of stress, is used to compare data. The effectiveness of the Bayesian Inference, J48 method, and Sequencing Minimum Optimisation (SMO) algorithm to forecast strain was evaluated using statistics from 16 participants gathered

across various stressful life scenarios.. The power spectrum components of the ECG and the statistical aspects of heart rate, GSR, frequency domain features of heart rate and its variability (HRV), were utilized to control the stress levels. Using the appropriate sensors, different Vital signs like Electrocardiogram, Eeg, Drg and others are employed frequently to extract characteristics and some of these aspects are then aggregated into clusters to help detect anxiety levels more effectively. it is found that utilizing the chosen General Regression Neural Network (GRNN)smaller clusters lead to balance in stress detection.

This has the effect of making various combinations of the sensor signal components that have been retrieved more effective at predicting the continuous anxiety level.The mean, median, and standard deviation of the heart signal's temporal domain properties are taken into account for uninterrupted real pressure detection. When classifying data to use a regression model like Development of large scale The classification based on stress is insufficient, according to the authors.

A classifier for stress detection was created in 2016 by Gjoreski et al. The GRNN model is utilized for evaluating ECG feature data in order to quantify stress. To categorise the anxiety levels, cardiovascular variability (Heart rate variability) and RR (time will be spent variable intervallength of two subsequent Rs) gap properties are used. classification technique was selected primarily because to its ability to generalize and strong mathematical foundation. After utilizing several kernels to build the models usingSVM,A linear SVM on both the Hr and Bp bandwidth outperformed other model options.. 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. Although though many businesses provide their employees programs connected to mental health, the problem is still far from under control. In this paper, we attempt to delve deeper into the issue at hand by attempting to identify stress patterns in the working population of the companies. In order to accomplish this, We would like to assess stress patterns and identify the variables that have a major influence on the degree of worry using visual processing as well as learning techniques.. KNN classifiers and other machine learning methods are used to categorize stress. In the initial stage of image processing for detection, the image of the personnel is taken and used as input. 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. Video frames are used as the input, and the output can be a picture or properties related to that image. Basically, image processing involves the following threesteps:

-> Importing the picture using tools for image capture.

-> Examining and modifying the picture.

-> A report or updated image that is the output of the image analysis.

Artificial intelligence in the form of machine learning enables systems to autonomously learn from and improve upon their own experiences without having to be explicitly programmed (AI). Computer programs that can access data and utilize it to educate themselves are created using machine learning. Explicit programming creates a mathematical model in pattern recognition utilizing "training examples" so that it can perform the task based on assumptions or opinions. To uncover new patterns that are only faintly visible in photographs, image mining is used to extract hidden data, associate image data, and detect new patterns. The fields of image processing, data mining, machine learning, and datasets are all interrelated in this area. 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 the risk of developing diabetes, ulcers, asthma, migraines, skin conditions, epilepsy, and erectile dysfunction. All of these illnesses, along with a number of others, are psychosomatic in nature, meaning that they are either brought on by or made worse by emotional states like stress.

Three different impacts of stress can be observed:

-> Stress can have a variety of subjective impacts, such as emotions of shame, anxiety, wrath, or frustration. In addition, they feel worn out, tense, anxious, irritable, moody, or lonely.

-> Behavioral impacts of stress depict observable alterations in a person's behavior. The effects of behavioral stress include an increase in accidents, drug or alcohol usage, inappropriate laughter, outrageous or combative behavior, extremely ecstatic moods, and/or overeating or drinking.

-> Cognitive stress has a number of negative impacts.

II. LITERATURE SURVEY

A:STRESS AND ANXIETY DETECTION USING FACIAL CUES FROM VIDEO

In this study, a method for identifying and assessing physiological stress/anxiety levels using video taped facial cues is created. A comprehensive experimental technique was developed to produce systematic variability of mental responses (impartial, calm, and anxious) through a widerange of internal and external stimuli. The study mainly concentrated on quasi and moderately visual expressions in order to evaluate the emotion expression more correctly. By using a camera mouth motion, gesture characteristics, gaze activities, and hrv all were recorded. Using feature selection approaches to determine the most accurate features in each experimental phase, classification algorithms were

employed to discriminate when comparing a calm atmosphere to that of pressure condition. A rating transformation utilising personal assessments also was suggested. to look into the relationship between face characteristics and the participant's reported level of stress or anxiety. According to the findings, certain facial signals 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 good accuracy.

*B:*INTEGRATING ML ALGORITHMS AND MEDICAL IMAGING TO DETECT ANXIETY

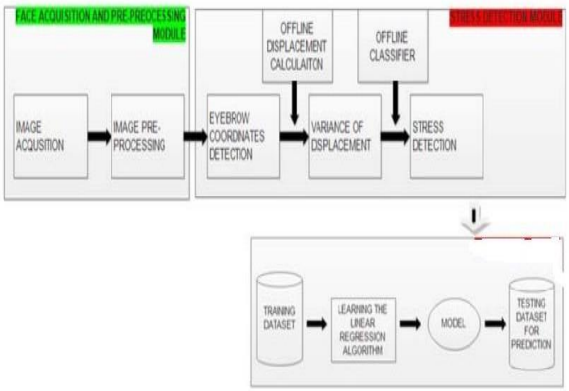
Stress is an unpleasant emotional arousal condition that individuals encounter in circumstances like spending long periods of time glued to a computer. Being stressed is a normal aspect of life.since we use them frequently now that they are a part of our life. While using a computer for work cannot entirely be avoided, it can at least be minimized if one is worried about getting stressed out at a certain time. When utilising a computer for an extended amount of time,it is crucial for someone's safety to monitor their mental state.In this study, real-time, unobtrusive videos are taken and used to analyze facial expressions to identify a person's emotional state. Every video frame contains a unique feelingthat we can identify, and we decide on the level of tension several hours after the video was shot. Theano that tries to decrease the execution time as well as the development timeof the deep learning method employed here, the linear regression model. The experimental findings demonstrate that the created system performs satisfactorily with datausing the general

C:MACHINE LEARNING METHODS FOR PREDICTING STRESS IN OFFICE WORKERS

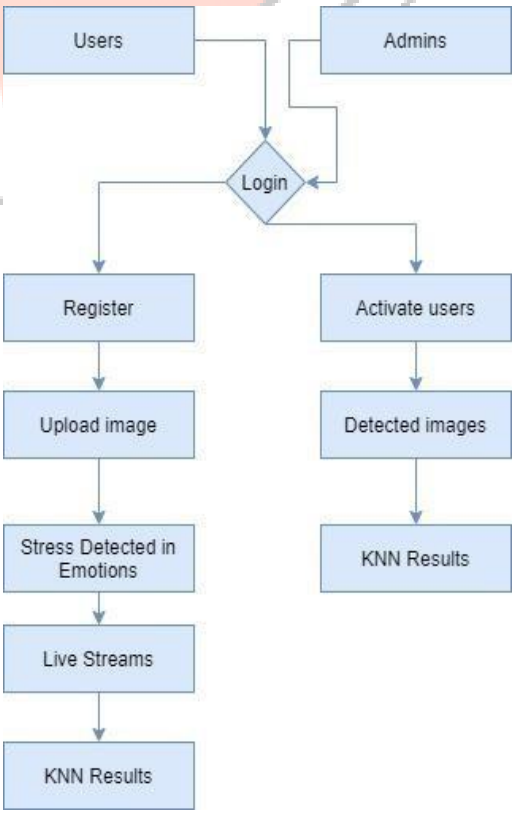
Technology workers in today's workforce regularly have stress-related problems. due to a change in lives and workplace environments, employees are now more likely to experience stress. Even while many companies and sectors Despite efforts to improve the workplace and the provision of psychological health programmers, the problem still has no control.

In this post, Use the methods of machine learning to investigate the behavior of individuals and discover the variables that most impact how stressed they are. Data from working professionals in the tech sector who participated mostly in 2017 OSMI mental health survey was taken into account in this regard. After meticulously cleaning and preparing the data, a variety of methods based on machine learning were used to train our model. The accuracy of the aforementioned models was assessed and contrasted. Among all the models that were used, boosting was the most accurate. Gender, family history, and the presence of health benefits at work were found to be relevant variables using Decision Trees.. With the aid of these results, firms can now concentrate on figuring out how to make their workforces more enjoyable and less stressful.

II. SYSTEM IMPLEMENTATION (METHODOLOGY)



It is a graphical framework that can be used to show how a systems works with regard to the information that is given into it, the different operations that are performed on it, as well as the data that is generated as a consequence of those actions. Flowcharts of data are the most important modelling tool (DFD). It is employed to build the models of the system's component pieces. These elements include howthe system functions, the data it uses, how it interacts with other parties, and how information flows through it.



MODULES:

- **User**
- **Admin**
- **Data Preprocess**
- **Machine Learning**

User:

The user can initially register. For further communication, he needed an operating e - mail and smartphone during registration. A user can be enabled by the administrator after registering. Once the administrator has authenticated the client, he can log onto our platform. The user must first enter an image into the system. The Py program will extract the image's characteristics and any pertinent emotion. Identifying many faces in a given photograph is also possible.

By using facial expressions like sadness, anger, etc., we will communicate our degree of stress. After finishing image processing, we will begin the live feed. Also, we can see multiple people's expressions in the live feed.

The TensorFlow live stream will produce quicker and better results than the TensorFlow live stream. After finished, we will load the dataset and calculate the precession scores for KNN classification accuracy.

Admin:

With his login information, administrator can sign in. After logging in, he can make the users active. Only our systems support logged-in access for activated users. Data for training and testing can be dynamically added to the project's code by the administrator. All user identification results are shown to the administrator in a covert frame.He can determine the feelings of photographs by clicking a hyperlink on the screen. The results of KNN classification found are also viewable by the admin..We can enhance the dataset size using fictitious values and authorizedindividuals.

Data Preprocess:

A grid view of a previously saved dataset with numerous characteristics is included in the file. As a result of thefeature selection in principle component analysis, which divides the features into six principal components: Condition Tension, Bodily Load, Productivity, and Frustration, A newly constructed dataset using Property Extraction is created only using numerical variables.

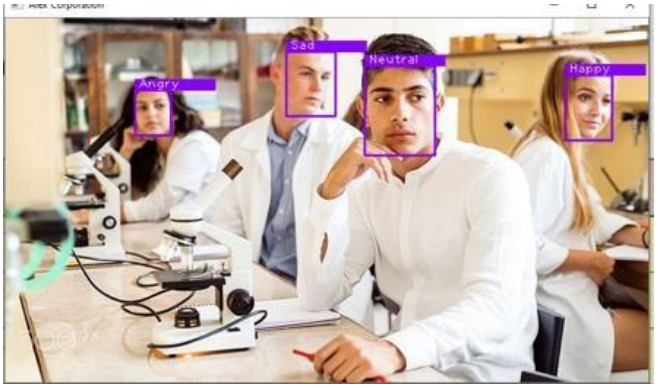
Machine Learning:

Both regression analysis and classification use the machine learning method known as K-Nearest Neighbor (KNN). The algorithm that decides whether or not a client requires medical assistance is called supervised learning. In terms of how similar factors considered are to KNN categorises dependent variables based on independent variables that are comparable instances from the previously obtained data. which KNN A mathematical analysis of categorization might be said to use a single dependent variable. KNN is employed in classification analysis to compute a KNN model's variables. The outcome variable inside a multimodal Nearest neighbor framework has a pair of potential values, "0" and "1,".

III. EXPERIMENTS & RESULTS

OUTPUT:

	Target	Time pressure	Interruption	Stress	Physical Demand	Performance	Frustration
0	1	0.004	-0.005	2.890	18.706	95.1440	11.579
1	0	-0.008	0.846	1.859	2.578	71.1150	34.964
2	0	0.003	0.724	1.477	3.357	66.7890	38.982
3	0	0.000	0.632	17.726	9.942	81.2410	32.815
4	0	-0.593	0.442	4.826	5.824	68.1320	39.392
5	1	-0.003	1.090	8.621	18.385	89.8880	34.327
6	0	-0.003	0.173	11.517	6.629	74.7160	36.288
7	0	-0.008	0.290	5.257	4.853	69.1420	47.998
8	0	-0.006	1.155	4.473	5.378	72.3140	39.369
9	0	-0.004	0.892	7.057	7.748	79.2260	34.466
10	0	0.001	0.282	5.028	6.400	69.5590	49.665
11	0	-0.004	0.279	4.509	12.510	84.6500	46.306
12	1	0.005	0.980	11.082	17.432	96.7990	38.317
13	1	0.003	0.980	11.082	17.341	110.0650	38.317
14	0	-0.001	0.947	6.213	6.173	71.0410	43.114
15	1	0.000	0.931	5.910	19.773	101.0650	35.590
16	0	-0.003	0.532	3.086	6.070	73.3550	37.487
17	0	-0.008	0.846	1.859	2.578	65.8920	36.898
18	0	0.003	0.724	1.477	3.357	82.4560	38.788
19	1	0.000	0.931	8.910	19.245	110.0650	32.598



IV. CONCLUSION

Using photographs taken by legitimate personnel, the secure Fault Diagnosis Capable of tracking employee anxiety

levels. That images capturing was performed entirely sowhen user has logged in based on a set time periods. The system instead analyze overall degree of anxiety utilizing methods of machine learning to get better findings.

V. FUTURE WORK

IoT technology integrated with biomedical wearable sensors is a tried-and-true combination in the healthcare industry. Both patients and therapists have profited from the usage of such gadgets. A few of its advantages include early diagnosis of medical issues, quicker medical help through Remote observation and communication, emergency alarm systems to alert the caretakers and private physician, etc.The suggested effort on creating a multimodal IoT system ensures to be a better health assistance for just an user by constantly monitoring and providing constant feedback on stress levels. It would be exciting to develop on this research into the development of a stress identification model in the future by incorporating other physiological indications, like an activity recognition system and the application of machine learning methods.

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VII. REFERENCES

[1] Shruthi Gedam, Sanchitha Paul , A Review on Mental Stress Detection Using Wearable Sensors and Machine Learning Techniques , published by IEEE(Volume 9), June 2, 2021.

[2] Riasat Khan, Low-Cost Heart Rate Sensor and Mental Stress Detection Using Machine Learning , published by IEEE,2021.

[3]U. Pluntke, S. Gerke, A. Sridhar, J. Weiss, and B. Michel, ‘‘Evaluation and classification of physical and psychological stress in firefighters using heart rate variability,’’ in Proc. 41st Annu. Int. Conf. IEEE Eng. Med.
Biol. Soc. (EMBC), Jul. 2019, pp. 2207–2212

[4]G. Giannakakis, D. Grigoriadis, K. Giannakaki, O. Simantiraki, A. Roniotis, and M. Tsiknakis, ‘‘Review on psychological stress detection using biosignals,’’ IEEE Trans. Affect. Comput., early access, Jul. 9, 2019, doi: 10.1109/TAFFC.2019.2927337.

[5]U. S. Reddy, A. V. Thota and A. Dharun, "Machine Learning Techniques for Stress Prediction in Working Employees," 2018 IEEE International Conference on Computational Intelligence and Computing Research (ICCIC), Madurai, India, 2018, pp. 1-4.

[6]Nisha Raichur, Nidhi Lonakadi, Priyanka Mural, “Detection of Stress Using Image Processing and Machine Learning Techniques”, vol.9, no. 3S, July 2017.

[7]B. Egilmez, E. Poyraz, W. Zhou, G. Memik, P. Dinda, and N. Alshurafa, ‘‘UStress: Understanding college student subjective stress using wrist based passive sensing,’’ in Proc. IEEE Int. Conf. Pervas. Comput. Commun. Workshops (PerCom Workshops), Kona, HI, USA, Mar.2017, pp. 673–678.

[8]G. Giannakakis , D. Manousos , F. Chiarugi, “Stress and anxiety detection using facial cues from videos,” Biomedical Signal processing and Control”, vol. 31, pp. 89- 101, January 2017.

[9]H. Lin, J. Jia,Q. Guo, Y. Xue, J. Huang, L. Cai, and L. Feng,“Psychological stress detection from cross-media microblog data using deep sparse neural network,” in Proc. IEEE Int. Conf.Multimedia Expo, 2014, pp. 1–6

[10] De Choudhury, M., Gamon, M., Counts, S., & Horvitz, E. (2013, July). Predicting depression via social media. In AAAI Conference on Weblogs and Social Media.

[11] Bakker, J., Holenderski, L., Kocielnik, R., Pechenizkiy, M., Sidorova, N.. Stess@ work: From measuring stress to its understanding, prediction and handling with personalized coaching. In: Proceedings of the 2nd ACM SIGHIT International health informatics symposium. ACM; 2012, p. 673–678.

[12] Villarejo, M.V., Zapirain, B.G., Zorrilla, A.M.. A stress sensor based on galvanic skin response (gsr) controlled by zigbee. Sensors 2012; 12(5):6075–6101.