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STRESS DETECTION USING MACHINE LEARNING TECHNIQUES

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ABSTRACT

In this paper we can detect the stress by using the machine learning algorithm. Nowadays, stress is a major problem for many youngsters. The time period that was formerly thought to be the most carefree is currently under a lot of stress. The stress increased a wide variety of problems such as depression, suicide, heart attack, and stroke. The body's natural response to change is a series of physical, emotional, and intellectual responses. Three classification algorithms, logistic regression, random forest, and the decision tree algorithm are applied. The stress dataset was downloaded from Kaggle. By comparing three algorithms, Random forest gives the best accuracy.

Keywords-Classification, Stress, Machine learning, Depression, Suicide.

1. INTRODUCTION

Stress is either an emotional or physical pressure. Any incident or study that gives you anxiety, rage, or frustration can trigger it. The body's reaction to a demand or challenge is stress. Similar to when it helps you avoid danger or fulfil a deadline; short-term stress can be beneficial. Everyone experiences stress; it is a natural human reaction. In actuality, the mortal body is built to observe stress and respond to it. When experience changes or challenges (stressors), body adapt to novel circumstances. Stress can help us stay awake, motivated, and prepared to avert danger. For instance, if you have a big test coming up, your body may work harder and stay awake longer as a result of a stress response. But when stressespersist without relief or rest periods, stress becomes an issue. The autonomic nerve system of the body regulates several bodily functions, including breathing, heart rate, and eyesight.

DEFINITION MACHINE LEARNING

Artificial intelligence (AI) has a subfield called machine learning that enables computers to learn and develop on their without having been specifically programmed. Machine learning concentrates on the creation of computer programmers that can access data and learn on their own. The learning process starts with observations or data, such as examples, direct experience, or instruction, so that we can seek for data patterns and use the instances to inform future judgments. The fundamental goal is for computers to learn on their own, without the need for human involvement, and to change their behavioraccordingly. We use a classification algorithm in this paper.

2. LITERATURE REVIEW

SS Panicker, et. al. [1], 2019 was defined as a various automated/semi-automated medical diagnosis system based on human physiology have been gaining enormous popularity and importance in recent years. Physiological features exhibit several unique characteristics that contribute to reliability, accuracy and robustness of systems. There has also been significant research focusing on detection of conventional positive and negative emotions after presenting laboratory-based stimuli to participants.

Aishwarya Bannore et al. [2] in 2021 defined Stress is a subjective phenomenon that is difficult to measure comprehensively. However, we can classify and quantify stress and how it affects one's personal health, including various biological and psychological vulnerabilities.

R. SAKTHIVEL et al. [3] in 2021 today's sedentary life leads to a plethora of lifestyle-related illnesses. This has led to the quest to predict diseases before they occur. In the past, research on stress prediction was carried out conventionally in a laboratory-based environment.

Qian Liu et al. [4] in 2022 Stress detection is a basic and essential task for examining the mental health of a given population. With the rapid digitalization leading to text-based forms of communication gaining dominance over spoken ones, there is now the chance to develop analytical studies for stress detection directly from textual inputs in social media.

Sanchita paul et al. [5] Stress is an escalated psycho-physiological state of the human body emerging in response to a challenging event or a demanding condition. Environmental factors that trigger stress are called stressors. In case of prolonged exposure to multiple stressors impacting simultaneously, a person's mental and physical health can be adversely affected which can further lead to chronic health issues.

Alisha Banga et al. [6] in 2019 Nowadays, there is a big problem with mental stress, especially in young people. The time period that was formerly thought to be the most carefree is currently under a lot of stress. Today's increased stress causes a variety of issues, including depression, suicide, heart attacks, and stroke.

M. Vani et al. [7] in 2020 Stress is a common part of everyday life that most people have to dealwith on various occasions. However, having long-term stress, or a high degree of stress, will hinder oursafety and disrupt our normal lives. Detecting mental stress earlier can prevent many health problems associated with stress.

Laavanya Rachakond et al. [8] Given the way people live nowadays, they merely sleep without realising the benefits it offers the body. The Smart-Yoga Pillow (SaYoPillow) is a suggested edge gadget that aims to fully materialise the concept of "Smart-Sleeping" and assist in understanding the relationship between stress and sleep. It is suggested to develop an edge processor using a model that examines bothsleeping patterns and the physiological changes that take place when we sleep. SaYoPillow is a revolutionary product with up to 96% accuracy, security features, and consideration of sleeping patterns for stress relief.

A Dharun et al. [9] in 2018 Stress disorders are a common issue among working IT professionals in the industry today. With changing lifestyle and work cultures, there is an increase in the risk of stress among the employees. Though many industries and corporates provide mental health related schemes and try to ease the workplace atmosphere, the issue is far from control.

Purnendu Shekhar Pandey [10] in 2017 According to a cardiac surgeon, it is difficult to predictage from heart rate as it is nonlinear, but we can use a person's heart beat to predict whether that personis fit, unfit and overtrained or not, provided we have that person's age.

E. Fuchs et al. [11] in 2011 It has become clear from the continually rising number of papers in the field of stress research that the traditional application of the stress concept has significant flaws. In our opinion, it is improper to use the term "stress" to situations ranging from even the most mildly stimulating challenges to extremely unpleasant ones.

Giorgos Giannakakis et al. [12] 2016 This review investigates the effects of psychological stress on the human body measured through bio signals. When a potentially threatening stimulus is perceived, a cascade of physiological processes occurs mobilizing the body and nervous system to confront the imminent threat and ensure effective adaptation.

Martin Griss et al. [13] 2017 Continuous stress monitoring may help users better under- stand their stress patterns and provide physicians with more reliable data for interventions. Previously, studies on mental stress detection were limited to a laboratory environment where participants generally rested in a sedentary position.

S. Sriramprakash et al. [14] 2017 tress detector classifies a stressed individual from a normal one by acquiring his/her physiological signals through appropriate sensors such as Electrocardiogram (ECG), Galvanic Skin Response (GSR) etc, these signals are preprocessed to extract the desired features which depicts the stress level in working individuals.

3. DATASET

S.No	Attribute	Туре	Range
1	Humidity	Numeric	10.5 - 29.82
2	Temperature	Numeric	79.9 – 98.79
3	Step count	Numeric	1 - 200
4	Stress Level	Numeric	0-Normal, 1 - Stress

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4. METHODOLOGY

The following diagram shows the Machine learning of stress detection.



Fig 4.1 Methodology of the research work

There are three algorithms used in this model. They are Decision tree, Random forest, Logistic Regression. Compare the algorithm and find the accuracy value. In this project, random forest algorithm gives the best accuracy.

5. CLASSIFICATION ALGORITHMS

There are three algorithms used in this model. They are Decision tree, Random forest, Logistic Regression. Compare the algorithm and find the accuracy value. In this project, the random forest algorithm gives the best accuracy.

DECISIONTREE

The most effective and well-liked technique for categorization and prediction is the decision tree. A decision tree is a type of tree structure that resembles a flowchart, where each internal node represents a test on an attribute, each branch a test result, and each leaf node (terminal node) a class label. It is among the most popular and useful techniques for supervised learning. They can be applied to jobs requiring classification and regression. It is a tree-structured classifier, where internal nodes stand in for the dataset's features, branches for the decision-making processes, and leaves for the best results. The Decision Node and Leaf Node are the two nodes of a decision tree.



Figure 5.1.1 Decision Tree

LOGISTICREGRESSIONALGORITHM

One of the most often used Machine Learning algorithms is logistic regression. It falls under the category of supervised learning. Using a predetermined set of independent factors, it is used to predict the categorical dependent variable. In a categorical dependent variable, the output is predicted via logistic regression. As a result, the result must be a discrete or categorical value. It can be either True or False, Yes or No, 0 or 1, etc., but rather than providing an exact value between 0 and 1, it provides probabilistic values that fall between 0 and 1. Assigning observations to a discrete set of classes is done using the classification process known as logistic regression. Email spam or not spam is one example of a classification problem.



Figure 5.2.1 Logistic Regression

RANDOM FOREST

The favored algorithm for machine learning A component of the supervised learning approach is Random Forest. It can be used for ML problems involving both regression and classification. Its foundation is the idea of ensemble learning, which is a technique for combining several classifiers to handle challenging problems and improve model performance 0. Instead of relying exclusively on one decision tree, the random forest uses the forecasts from each decision tree and is based on the majority votes of predictions to predict the outcome. The greater number of trees in the forest prevents higher accuracy and over fitting. This approach aims to identify the greatest feature from all the features at random.



Fig 5.3.1 Random Forest

6. EXPERIMENTAL RESULT

Comparison of Classification Algorithms

S.NO	Name of the Algorithm	Accuracy
1.	Decision Tree	60%
2.	Random forest	100%
3.	Logistic Regression	40%

7. CONCLUSION AND FUTURE SCOPE

This work reports the impact of different Machine Learning techniques for stress detection. The Performance analysis of three algorithms, namely Random forest, Logistic Regression and Decision Tree is performed and accuracy is obtained. When it comes to accuracy, it is observed that the Random forest algorithm outperforms more than the Logistic Regression and Decision Tree algorithms. Hence, by using Random forest, the prediction of stress detection is performed and the result is obtained.

The future work of this research can be made to additional improvement using k-fold cross- validation, which has an impact on the

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additional improvement metrics. The automation of stress detection using actual real time data from health care organizations and agencies, which can be built using big data. They can be fed as streaming data and by using the data, investigation of the patients in real time can be prepared. We can detect the stress by using the sensor.

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