

Research Article

Stress Predication System Using Machine Learning Algorithm

Swaranjali Suresh Ghodake and Prof Bere Sachin S.

Department of Computer Engineering Dattakala, Group of Institution Faculty of Engineering,

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Abstract

Long-time period exposure to pressure may lead to critical health issues which include those related to the immune, cardiovascular, and endocrine systems. Once having arisen, these issues require a substantial investment of money and time to recover from. With early location and treatment, be that as it may, these medical issues might be stopped from developing in any way, in this manner improving personal satisfaction. Stress disorders are a common issue among working 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. In this system, we would like to apply machine learning techniques to analyze stress patterns in working adults and to narrow down the factors that strongly determine the stress levels

Keywords: Classification ,deep learning, stress dataset

Introduction

Stress is a serious health problem that afflicts a large fraction of humanity. Three out of four visits to the specialist are because of stress-related issue. Stress can be divided into two parts: stressor and reaction. Stressor is the activity or effect that triggers a change in the physiological parameter values of the human body. Reaction is the deviation of these parameter values from their normal levels. When confronted with a stressor, the body raises an alarm that results in the stress response. The stress response of the body depends on the duration for which the stressor is active. With long and frequent stress responses, The person will become much more likely to develop critical health problems. The health problems range in a completely wide range. For e.g, immoderate exposure to strain may result in depression.

Literature Survey

This investigation speaks to a plan of a recognition arrangement of worry through AI utilizing some accessible bio flags in human body. Stress can be regularly characterized as the aggravation in mental balance.[1] Stress location is one of the significant research territories in biomedical building as appropriate recognition of stress can helpfully forestall numerous mental and physiological issues like cardiovascular cadence variations from the norm or arrhythmia. There are a few bio-signals accessible (for example ECG, EMG, Respiration, GSR and so on.) which

are useful in identifying feelings of anxiety as these signs shows trademark changes with pressure acceptance. Right now, was chosen as the essential applicant in view of the effectively accessible account (for example a few portable clinical evaluation recorders are accessible now in the market) and ECG include extraction procedures. Another favorable position of ECG is that respiratory sign data can likewise be recognized structure ECG which is known as EDR (ECG determined Respiration) without having separate sensor framework for breath estimation. Highlights of ECG signals are unmistakable and assortment of the signs is cost-effective. From ECG we inferred RR interim, QT interim, and EDR highlights for the improvement of the model. For the usage of an administered AI (SVM) strategy in MATLAB, Physionet's "drivedb" database was utilized as the preparation dataset and approval. SVM was picked for arrangement, as there are two classes of marked information; 'pushed' or 'nonfocused'. A few SVM model sorts were confirmed by changing the element number and Kernel type. Our outcomes indicated a precision level of 98.6% with Gaussian Kernel capacity and utilizing every accessible component (RR, QT and EDR), which likewise accentuates the significance of respiratory data in stress location through Machine Learning. [2]The pressure framework arranges the versatile reactions of the creature to stressors of any kind.(1). The primary segments of the pressure framework are the corticotropin-discharging hormone (CRH) and locus ceruleus-norepinephrine (LC/NE)-autonomic frameworks and their fringe effectors, the

pituitary-adrenal hub, and the appendages of the autonomic framework. Initiation of the pressure framework prompts social and fringe changes that improve the capacity of the living being to modify homeostasis and increment its odds for endurance. [2]The CRH and LC/NE frameworks invigorate excitement and consideration, just as the mesocorticolimbic dopaminergic framework, which is associated with expectant and reward marvels, and the hypothalamic betaendorphin framework, which smothers torment sensation and, subsequently, expands absence of pain. CRH represses hunger and actuates thermogenesis through the catecholaminergic framework. Likewise, corresponding associations exist between the amygdala and the hippocampus and the pressure framework, which animates these components and is managed by them. CRH assumes a significant job in restraining GnRH emission during stress, while, by means of somatostatin, it likewise hinders GH, TRH and TSH discharge, smothering, in this manner, the conceptive, development and thyroid capacities. Strikingly, every one of the three of these capacities get and rely upon positive catecholaminergic input. The end-hormones of the hypothalamic-pituitary-adrenal (HPA) pivot, glucocorticoids, then again, have numerous jobs. [2]They at the same time repress the CRH, LC/NE and beta-endorphin frameworks and animate the mesocorticolimbic dopaminergic framework and the CRH peptidergic focal core of the amygdala. What's more, they straightforwardly repress pituitary gonadotropin, GH and TSH discharge, render the objective tissues of sex steroids and development factors impervious to these substances and stifle the 5' deiodinase, which changes over the moderately dormant tetraiodothyronine (T(4)) to triiodothyronine (T(3)), contributing further to the concealment of regenerative, development and thyroid capacities. They have immediate just as insulin-interceded impacts on fat tissue, at last advancing instinctive adiposity, insulin obstruction, dyslipidemia and hypertension (metabolic disorder X) and direct consequences for the bone, causing "low turnover" osteoporosis. Focal CRH, by means of glucocorticoids and catecholamines, hinders the provocative response, while legitimately emitted by fringe nerves CRH invigorates neighborhood aggravation (resistant CRH). CRH rivals might be valuable in human pathologic states, for example, melancholic despondency and interminable uneasiness, related with incessant hyperactivity of the pressure framework, alongside unsurprising social, neuroendocrine, metabolic and safe changes, in view of the interrelations plot above. On the other hand, potentiators of CRH emission/activity might be helpful to treat atypical melancholy, post birth anxiety and the fibromyalgia/ceaseless weariness disorders, all portrayed by low HPA hub and LC/NE action, exhaustion, burdensome symptomatology, hyperalgesia and expanded safe/fiery reactions to boosts.

This investigation inspected constant and momentary pressure consequences for pulse changeability (HRV), contrasting time, recurrence and stage space (unpredictability) quantifies in 50 sound grown-ups.[3] The problems recurrence subscale of the joined issues and elevates scale (CHUS) was utilized to gauge ceaseless pressure. Transient stressor reactivity was surveyed with a discourse task. HRV measures were resolved by means of surface electrocardiogram (ECG). Since breath rate diminished during the discourse task ($p < .001$), this investigation evaluated the impact of breath rate changes on the impacts of premium. A progression of rehashed estimates examinations of covariance (ANCOVA) with Bonferroni change uncovered that momentary pressure diminished HR D2 (determined by means of the pointwise relationship measurement PD2) ($p < .001$), yet expanded HR mean ($p < .001$), standard deviation of R-R (SDRR) interims ($p < .001$), low (LF) ($p < .001$) and high recurrence band power (HF) ($p = .009$). Respiratory sinus arrhythmia (RSA) and LF/HF proportion didn't change under transient pressure. Incomplete connection changing for breath rate indicated that HR D2 was related with constant pressure ($r = -.35$, $p = .019$). Differential impacts of constant and transient pressure were seen on a few HRV measures. HR D2 diminished under both pressure conditions reflecting brought down usefulness of the heart pacemaker. The outcomes affirm the significance of multifaceted nature measurements in present day stress inquire about on HRV.

The headway in the cell phones, remote and web advances offered ascend to the new application that will make the democratic procedure exceptionally simple and productive.[4]The E-casting a ballot guarantees the chance of advantageous, simple and safe approach to catch and include the votes in a political race. This exploration venture gives the detail and necessities to E-Voting utilizing an Android stage. The e-casting a ballot implies the democratic procedure in political race by utilizing electronic gadget. The android stage is utilized to build up an e-casting a ballot application. From the outset, a presentation about the framework is introduced through a general chart. Areas II and III depict all the ideas (review, plan and usage) that would be utilized right now. At long last, the proposed e-casting a ballot framework will be given the got outcomes.

Stress advances adjustment, however drawn out pressure leads after some time to mileage on the body (allostatic load). Neural changes reflect the example seen in other body frameworks, that is, transient adjustment versus long haul harm.[5]Allostatic load prompts debilitated insusceptibility, atherosclerosis, corpulence, bone demineralization, and decay of nerve cells in the mind. [5]A large number of these procedures are found in significant burdensome sickness and might be communicated likewise in other interminable nervousness issue. The mind controls the physiological and social adapting reactions to day by day occasions and stressors. The hippocampal

development communicates significant levels of adrenal steroid receptors and is a flexible mind structure that is significant for specific sorts of learning and memory. It is likewise helpless against the impacts of pressure and injury. The amygdala intercedes physiological and social reactions related with dread.[5] The prefrontal cortex assumes a significant job in working memory and official capacity and is likewise engaged with termination of learning. Every one of the three areas are focuses of pressure hormones. In creature models, neurons in the hippocampus and prefrontal cortex react to rehashed worry by indicating decay, though neurons in amygdala show a development reaction. However, these are not really "harmed" and might be treatable with the correct prescriptions.

It has gotten normal for individuals to encounter pressure, for the most part in light of its diverse nature – physical, mental, passionate, social, and so forth. Unmonitored stress may demonstrate destructive to one's wellbeing coming about in even ceaseless sicknesses. Since stress is exceptionally abstract, stress the executives isn't clear. Numerous endeavors have been made to identify and measure pressure.[6] In any case, a precise appraisal can be produced using physiological estimations as it were. Right now, have shown how electrodermal movement (EDA), which speaks to the thoughtful reaction to stretch, could be utilized for precise arrangement of worry by building up an AI based order model. 30 members were exposed to Trier Social Stress Test (TSST), and EDA and accelerometer information were recorded utilizing a wrist-worn gadget. Datasets containing pressure and non-stress periods were sectioned and physically labeled for model preparing, in view of recorded pressure convention course of events. A kNN-classifier model was prepared on datasets from 15 members and tried on datasets from the staying 15 members, and the outcomes were checked with salivary cortisol levels recorded when TSST. [6]The proposed kNN classifier has affectability and explicitness of 94% and 93% individually. Movement debasements because of hand developments were identified utilizing the accelerometer information and were named 'movement influenced'. The classifier had the option to order – the standard districts of all members as non-stress, 93% of the TSST locales as stress and 63% of the post-stress areas as non-stress. Stress is a mental condition that diminishes the nature of rest and influences each aspect of life.[7] This paper gives a compelling technique to the discovery of psychological feelings of anxiety utilizing information gave from a physical action tracker gadget created by FITBIT. The primary intention of this framework was to use a AI approach in pressure identification utilizing sensor innovation. Separately, the impact of every stressor was assessed utilizing calculated relapse and afterward a consolidated model was fabricated and evaluated utilizing variations of ordinal strategic relapse models including logit, probit, and reciprocal log-log. [7]This

framework was utilized and assessed in a constant environment by taking data from adults working in IT and other areas in India. The oddity of this work lies in the way that a pressure identification framework ought to be as non-obtrusive as feasible for the client.

Stress is the underlying driver of numerous ailments and undesirable practices.[8] Having the option to screen when and why an individual is pushed could illuminate individual pressure the board just as mediations when fundamental.[8] Right now, present StressAware, an application on the Amulet wearable stage that groups the feeling of anxiety (low, medium, high) of people ceaselessly and continuously utilizing pulse (HR) and heartrate fluctuation (HRV) information from a business pulse screen. We built up our pressure location model utilizing a Support Vector Machine (SVM).[8] We prepared and tried our model utilizing information from three sources and had the accompanying fundamental outcomes: PhysioNet, an open physiological database (94.5% exact with 10-overlay cross approval), a field study (100% precise with 10-crease cross approval) and a lab study (64.3% exact with forget about one cross-approval). Testing the StressAware application uncovered an anticipated battery life of as long as 12 days.[8] Additionally, the ease of use input from subjects demonstrated that the Amulet can possibly be utilized by individuals for checking their feelings of anxiety. The outcomes are promising, demonstrating that the application might be utilized for pressure discovery, and in the end for the advancement of stress-related intercession that could improve the soundness of people.

We present the Fit4Work framework for checking and the executives of physical, mental and natural worry at the working environment. The framework was structured explicitly for more seasoned specialists who are dependent upon inactive distressing work in an office domain.[9] It utilizes industrially accessible gadgets and savvy techniques, which use AI models to screen the three parts of the clients' way of life, and give proposals to improving them. The outcomes show that the framework can sufficiently perceive the client's physical exercises, gauge vitality use and distinguish mental worry, just as perceive and reason about undesirable condition. The framework gives suggestions as indicated by the checking results. Catchphrases— Physical action checking, mental pressure location, condition quality administration, wearable sensors, encompassing sensors. [10]. Stress is a typical piece of day by day life which a great many people battle in various events. Be that as it may, having worry for quite a while, or an elevated level of pressure will endanger our security, and will disturb our typical life. Therefore, execution and the executives capacity in basic circumstances corrupt altogether.[10] Along these lines, it is important to have data in stress comprehension and plan frameworks with the capacity of stress insight. Right now signal preparing approach is presented dependent on AI calculations. We utilized gathered organic information,

for example, Respiration, GSR Hand, GSR Foot, Heart Rate and EMG, from various subjects in various circumstances and spots, while they were driving. At that point, information division for different time interims such 100, 200 and 300 seconds is performed for various feeling of anxiety.[10]We extricated measurable highlights from the sectioned information, and feed this highlights to the accessible classifier. We utilized KNN,Kclosest neighbor, and bolster vector machine which are the most well-known classifiers. We arranged the worry into three levels: low, medium, and high. Our outcomes show that the feeling of anxiety can be recognized by precision of 98.41% for 100 seconds and 200 seconds time interims and 99% for 300 seconds time interims.

More and more teenagers today are overloaded with juvenile worry from various angles: scholastic future, selfcognition, between close to home, and love.[11] Dependable pressure may prompt nervousness, withdrawal, animosity, or poor adapting abilities, for example, medication and liquor use, compromising young people's wellbeing and improvement. Henceforth, it is significant for the two youngsters and their gatekeepers/educators to know about the worry ahead of time, and deal with the worry before it gets extreme and starts messing wellbeing up. The present internet based life smaller scale blog offers an open channel for us to opportune and subtly sense adolescent's pressure dependent on his/her tweeting substance and practices. This examination depicts a system to additionally anticipate youngster's future youthful anxiety from smaller scale blog, and talks about how we address the difficulties (information inadequacy and multi-faceted expectation) utilizing AI and multi-variation time arrangement forecast strategies. Anticipated occasions that may conceivably influence young person's feelings of anxiety are additionally joined into our forecast technique. Our exploratory outcomes show the viability of considering associated highlights and occasion influence in forecast. As far as we could possibly know, this is the first take a shot at anticipating adolescent's future anxiety by means of smaller scale blog

Brainwave mirrors the change in electrical potential coming about because of the combination among mind neurons.[12] A neuron can get signals from different neurons and starts off cyclic release response when adequate vitality is amassed. That is additionally the motivation behind why individuals perseveringly transmit brainwaves. As indicated by specialists from Laboratory of Brain Recognition and Behavior, Michigan University, longterm perform various tasks activity brings about the absence of proficiency and in sifting through immaterial signs prompts the interruption of focusing of the unimportant message instead of business related data. Thus, one would have issues in the change starting with one occupation then onto the next. In any case, for certain individuals depend on their mind to manage numerous things and it might prompt weariness. Along these lines, we did

this test and attempted to make sense of the most productive approach to mitigate the profound weight and quiet the psyche down. We use profound learning as learning technique to foresee client's pressure feeling through tuning in to the music. Through above research, by tuning in to music or make the air of a music foundation likewise with a masterful execution could give mental treatment impact as well as improve the capacity of the individual to center.

[13] Finding and displaying of pressure examples of people is a key advance towards accomplishing programmed pressure monitoring, stress the executives and solid way of life. As various wearable sensors become main stream, it gets workable for people to secure their own significant tactile information and to naturally evaluate their feeling of anxiety in a hurry. Past examinations for stress investigation were directed in the controlled research center and facility settings. These examinations are not appropriate for pressure checking in one's every day life as different physical exercises may influence the physiological signs.[13]Right now, address such issue by coordinating two modalities of sensors, i.e., HRV sensors and accelero meters, to screen the apparent feelings of anxiety in every day life. We accumulated both the heart and the movement information from 8 members persistently for around about fourteen days. We at that point extricated highlights from both tangible information and looked at the current AI strategies for learning customized models to decipher the apparent feelings of anxiety. Exploratory outcomes demonstrated that Bagging classifier with include determination can accomplish a forecast precision 85.7%, showing our pressure checking on regular schedule is genuinely reasonable.

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85.7%, showing our pressure checking on regular schedule is genuinely reasonable. Stress discovery has an immense potential for ailment anticipation and the executives, and to improve the personal satisfaction of individuals.[15] Additionally, work security can be improved if stress is convenient and dependably identified. The accessibility of ease customer wearable gadgets that screen fundamental signs, offers access to pressure location plans. Pulse changeability (HRV), a stressrelated indispensable sign, was gotten from wearable gadget information to dependably decide feelings of anxiety. So as to fabricate and prepare a deployable pressure indicator, we gathered named HRV information in controlled conditions, where subjects were presented to physical, mental and consolidated pressure.[15]We at that point applied AI to isolate and recognize the distinctive pressure types and comprehend the relationship with HRV information. The subsequent C5 choice tree model is equipped for distinguishing the pressure type with 88% exactness, in a 1-minute time window. Just because physical and mental pressure can be recognized with a 1-minute time goals from smokedivers, firemen, who enter high-hazard conditions to safeguard individuals, and experience extreme physical and mental pressure. To improve our model, we made a coordinated framework to get master marks progressively from firemen during their preparation in a Rescue Maze. A next objective is to move the calculations into conventional frameworks for observing and instructing high-hazard experts to improve their pressure versatility during preparing and lessen their hazard in the field. Stress issue are a typical issue among working IT experts in the business today.[16] With changing way of life and work societies, there is an expansion in the danger of worry among the representatives. In spite of the fact that numerous businesses and corporates give emotional well-being connected plans and attempt to facilitate the working environment climate, the issue is a long way from control. Right now, might want to apply AI systems to examine pressure designs in working grown-ups and to limit the elements that unequivocally decide the feelings of anxiety. Towards this, information from the OSMI emotional wellness study 2017 reactions of working experts inside the tech-business was considered.[16]Different Machine Learning systems were applied to prepare our model after due information cleaning and preprocessing. The exactness of the above models was acquired and concentrated nearly. Boosting had the most elevated exactness among the models actualized. By utilizing Decision Trees, conspicuous highlights that impact pressure were recognized as sex, family ancestry and accessibility of medical advantages in the work environment. With these outcomes, ventures would now be able to limit their way to deal with lessen pressure and make a much agreeable working environment for their representatives. With the improvement of present day knowledge innovation, BP

Neural Network (BP-NN) and Support Vector Machine (SVM) have become interesting issues of current global AI people group.[17]So as to take care of the capacity fitting issue about the inner worry of artistic glue, a fitting technique based BP-NN and SVM is proposed right now.

Proposed System

The system is designed with a propose to continuously track human stress level and try to contain it within normal levels.

Advantages of proposed system:

- Keeps the track on the stress.
- Easy to recover when the stress detected at an early level
-

A. Architecture

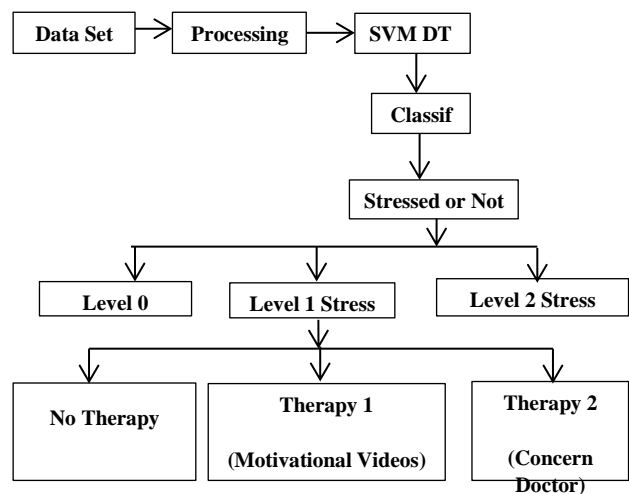


Fig: 3.1 Proposed System Architecture

B. Algorithm

What is Support Vector Machine?

The objective of the aid vector device set of rules is to discover a hyper-plane in an N-dimensional space(N — the variety of features) that enormously classifies the statistics points.

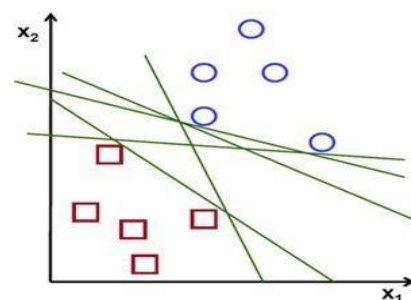


Fig.2. N-Dimensional Hyperplane

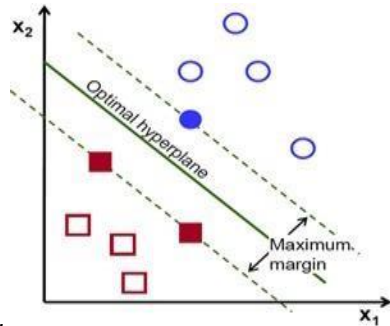


Fig.3.Optimal Hyperplane and Margin

Possible hyperplanes

To separate the two lessons of information factors, there are many possible hyperplanes that might be chosen. Maximizing the margin distance presents a few reinforcement so that future statistics factors can be classified with more confidence.

Hyperplanes and Support Vectors

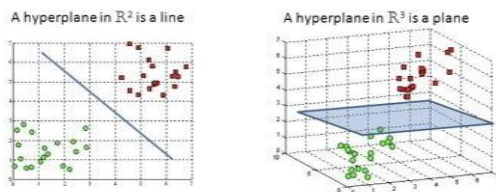


Fig.4. Labeled and Train data divided using Hyperplane

Hyperplanes in 2D and 3D feature space:

Hyperplanes are decision boundaries that help classify the records points. Data factors falling on either side of the hyperplane can be attributed to one-of-a-kind lessons. Also, the size of the hyperplane relies upon upon the range of features. If the quantity of input functions is 2, then the hyperplane is only a line. If the range of input features is 3, then the hyperplane turns into a two dimensional plane. It will become tough to assume when the number of capabilities exceeds 3.

Support Vectors

Support vectors are information factors that are closer to the hyperplane and influence the position and orientation of the hyperplane. Using these assist vectors, we maximize the margin of the classifier. Deleting the guide vectors will trade the placement of the hyperplane.

Large Margin Intuition

In logistic regression, we take the output of the linear feature and squash the cost within the range of [0,1] using the sigmoid characteristic. If the squashed price is extra than a threshold cost(0.5) we assign it a label 1, else we assign it a label 0. In SVM, we take the output of the linear feature and if that output is more than 1, we pick out it with one class and if the output is 1, we

perceive is with every other class. Since the threshold values are changed to 1 and -1 in SVM, we obtain this reinforcement range of values([-1,1]) which acts as margin.

Results and Discussions

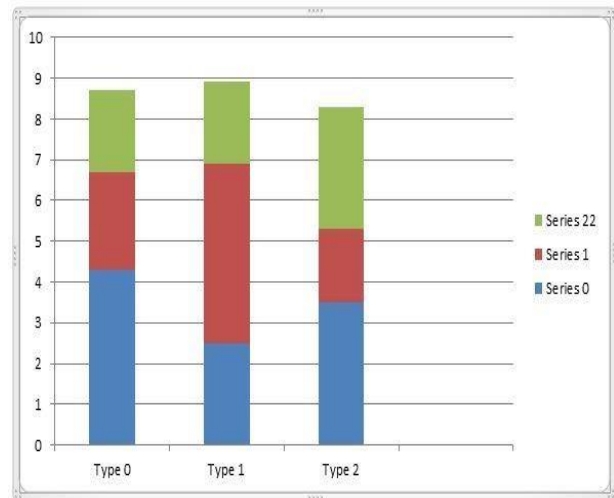


Fig. 4.1 Stress Detection in Different types

The above graph shows the stress level in three different types: Fig 4.1. Shows the parameters that are represented through the x and y axis. The x axis shows the percentage of stress and y shows the types.

Type 0:- When a person’s stress level detected is 0 or as type 0 Then the person is said to be stress free and is suggested no therapy.

Type 1:- When a person’s stress level detected is 1 or as type 1 Then the person is said to have stress at initial stage and is suggested therapy like motivational videos.

Type 2:- When a person’s stress level detected is 2 or as type 2 Then the person is said to have stress at severe stage and is suggested therapy like concerning doctor.

Conclusions

In this system ,different models to detect stress has been trained using multiple features .This method to detect stress and can help an individual to assess one’s psychological condition as well as physical condition, from which he/she will be able to take necessary precautions. It was also concluded that, the more features we use, the more accurate the model becomes.

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