Stress Detection using Physiological Parameters

Namrata Edke[1], Ketan Singh[2], Tejas Gulve[3], Kalidas Bhawale[4]

[1]*Student VIII SEM, B.E., Computer Engineering, DRIEMS, Neral, India*
[2]*Student VIII SEM, B.E., Computer Engineering, DRIEMS, Neral, India*
[3]*Student VIII SEM, B.E., Computer Engineering, DRIEMS, Neral, India*
[4]*Professor, Department of Computer Engineering, DRIEMS, Neral, India*

Abstract - *In today's world one among the key leading factors to unhealthiness is STRESS. the fundamental Parameters on which the strain is identified are pulse, chest pain, resting pressure level, serum cholesterol which provides detailed information about the state of mind of person. In last year the impact of the strain on the society has been increased, leading to 77% of individuals that frequently experiences physical symptoms caused by stress with a negative impact on their personal and vocation, especially in aging and dealing population. Many algorithms like support vector machine, naïve byes, forest tree is used supported the accuracy. hormones modulate immune function, as noted elsewhere during this volume. These parameters are defer from person to person, their body condition, age, gender etc.*

Key Words: Stress Detection, physiological Parameters, Heart rate variability, Blood Pressure variability.

1. INTRODUCTION

Stress could be a popular term denoting process believed to contribute to a spread of mental and physical conditions. There are three different perspectives of studying and defining the strain. This three perspectives differ in terms of relative emphasis each places on the environment, the organism, and therefore the interaction between organism and environment over time. Stress activates the sympathetic nervous system(SNS), which regulates pressure level, heart rate, and release of cathecolamines; and therefore the hypothalamic-pituitary-adrenal(HPA) axis, which regulates release of corticosteroids. Immune cells possess receptors for both cathecholamines and glucocorticoids, and there's substantial evidence that these hormones modulate immune function, as noted elsewhere during this volume. These parameters are defer from person to person, their body condition, age, gender etc.

2. LITERATURE SURVEY

Paper 1:
Monika Chauhan, Shivani V. Vora, Dipak Dabhi [1]

In this paper, stress detection is proposed by using physiological parameters like heart rate and blood pressure. The difficulty in this paper is the parameters are very limited and the accuracy of the system depends on more number of parameters used.

Paper 2:
F. Mokhayeri, M-R. Akbarzadeh-T, S.Toosizadeh [2]

This paper proposes the mental stress detection using three signals pupil diameter, Electrocardiogram and Photoplethysmorgam and is analysed by using soft computing techniques. This paper also includes fuzzy technique for uncertainty handling. This system worked on PIPAS dataset.

Paper 3:
Healey, J. A., & Picard, R. W. (2005) [3]

This paper proposes the system of detecting the stress during real-world driving task. This system used the data in three different driving conditions i.e. during the rest, highway driving and city driving and this comes with the 97% of the accuracy. But the difficulty with the system is that only stress is detected only driving and no overall stress can estimated by this system.

3. SYSTEM ANALYSIS

A. Methodology

The heart disease dataset may contain unfiltered values so the dataset must be cleaned first and then used. All the null values in the dataset must be replaced by the mid-value of the data present in the dataset so that the accuracy of the stress detection should be high and the result obtained should be useful.

The dataset contains age, sex, pain type, resting pressure level, serum cholesterol, fasting blood glucose, resting electrocardiographic, maximum rate achieved. The dataset contains this different parameters if form comma separated values(CSV). Different machine learning algorithms are often accustomed check whether the person is in stress or not? But the algorithm with the very best accuracy are going to be selected for the analysis of the strain. Basically during this method fast-tree-regression algorithm are going to be used. As for the detection for stress various parameters should be taken into consideration and fast-tree-regression algorithm considers all this different aspects of the information set and hence processes the data to induce the result.
The below figure shows the dataset used for the processing of stress detection.

```
age,sex,cp,trestbps,chol,fbs,restecg,
thalach,exang,oldpeak,slope,ca,thal,target
63,1,3,145,233,1,0,150,0,2.3,0,0,1,1
37,1,2,130,250,0,1,187,0,3.5,0,0,2,1
41,0,1,130,204,0,0,172,0,1.4,2,0,2,1
56,1,1,120,236,0,1,178,0,0.8,2,0,2,1
57,0,0,120,354,0,1,163,1,0.6,2,0,2,1
57,1,0,140,192,0,1,148,0,0.4,1,0,1,1
```

Figure 1: Sample heart disease dataset from Kaggle dataset.

B. Classification

Fast Tree Regression:

Fast Tree is an efficient implementation of the MART gradient boosting algorithm. Gradient boosting may be a machine learning technique for regression problems. It builds each regression tree during a step-wise fashion, employing a predefined loss function to live the error for every step and corrects for it within the next. So this prediction model is truly an ensemble of weaker prediction models. In regression problems, boosting builds a series of such trees during a step-wise fashion and so selects the optimal tree using an arbitrary differentiable loss function. MART learns an ensemble of regression trees, which may be a choice tree with scalar values in its leaves. a choice (or regression) tree could even be a binary tree-like flow chart, where at each interior node one decides which of the 2 child nodes to still supported one in every of the feature values from the input. At each leaf node, a price is returned. within the within nodes, the choice relies on the test x <= v where x is that the price of the feature within the input sample and v is one in every of the possible values of this feature. The functions which may be produced by a regression tree are all the piece-wise constant functions.

C. Proposed Flow

Input Parameters

We propose a fully automated and secure system, which uses NFC-enabled smartphone interacting with a payment terminal to quickly and securely process the transaction involving toll collection and receipt delivery. The new system also maintains a database that logs all transactions. In case of failure to pay toll, the system tracks the vehicle and delivers and email to the defaulter with outstanding charges.

Age: This parameter is used only in order to recognise the age group suffering from the problem of stress. The age differs from young age to old age.

Sex: This parameter just helps us to recognise which sex group is suffering from the stress.

Chest pain type*:* CP type differs in range of 0-3, where 0 means no pain where as 3 means severe pain. This factor widely contributes in detection of the stress in humans.

Fasting Blood Sugar: FBS is used to determine the diabetic factor in patient. This is also used to find the answer to question whether the diabetic patient suffer from stress or not? And if yes what is the ratio of the patient suffering from the stress.

Resting Electocardiograph Result: Resting ECG plays an very vital role in determination of the stress in humans. The range of ECG lies in between 0-1, which means that 0 indicates the normal range of resting ECG whereas 1 indicates the increased rate of resting ECG factor in human body.

Resting Blood Pressure*:* When body is under anxiety body reacts through the increased rate of blood flow to the blood vessels which results in the increase of blood pressure. If the range of BP is in between 80-120 then it is referred to as normal, if BP is in between 89-139 then it is referred as high blood pressure and if the BP is greater than 140 than the patient is suffering from the hypertension and he/she needs to consult doctor immediately.

Maximum Heart Rate Achieved: This parameters is basically taken into consideration for determination of the heart rates, heart rates differ from age groups and if the count goes beyond the specified range then the person may be suffering from the heart disease and he/she is advised to take rest and if the problem conditions increases unconditionally than he/she must consult doctors as soon as possible.

Old Peak: This is used to determine the ST depression induced by exercise to relative rest. This is basically used to track the rise in blood pressure due to any heavy exercise or work. If the count of this old peak value goes beyond than the specified range the person is advised to take rest and avoid such heavy workouts as it may lead to many health related issues in future.

Exercise Induced Angina: Angina is usually caused from not getting enough blood through the arteries to produce the walls of the guts with enough blood

flow to adequately pump. Angina will be caused by blockage, injury or spasms. It will be particularly irritating when it comes on with exercise and should end in increase of pressure level and patient may go faint thanks to

inadequate supply of blood and which may be directly or indirectly affect the guts rate of the patient.

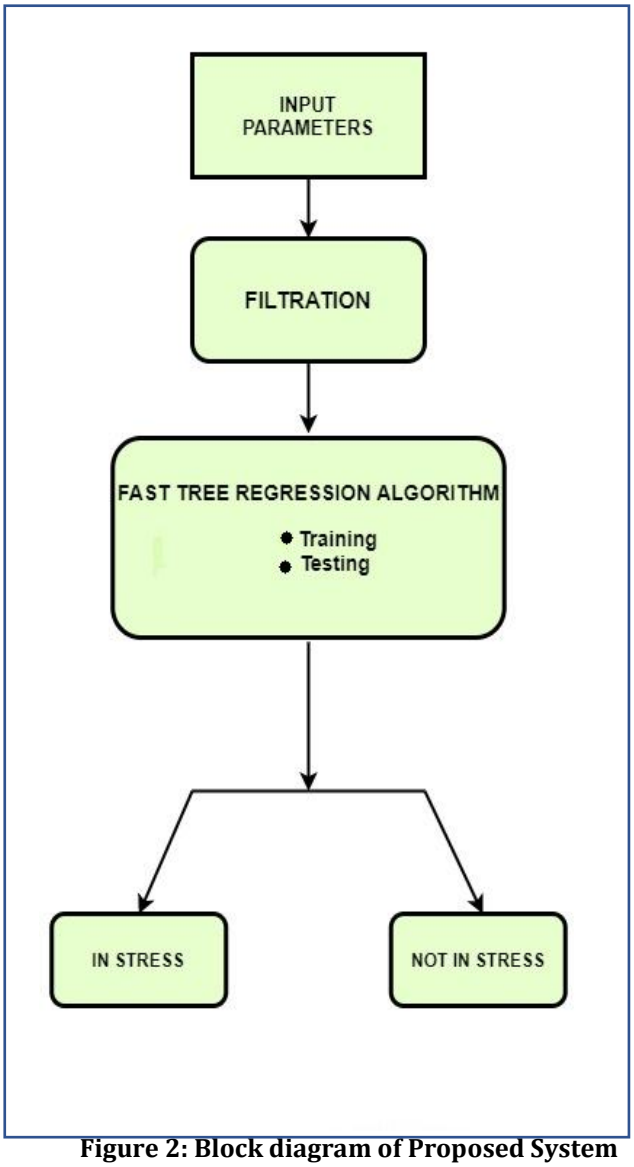

Figure 2: Block diagram of Proposed System

Filtration

Filtration phase includes the pre-processing of dataset i.e. removing the null values if any there in the dataset, and checking all the values which is suitable for the implementation of the project, if there is any null value in the dataset then it can be replaced by the average or mid value of all the value present into the dataset. Filtration also helps to remove unwanted data from the set which are not suitable for the process.

Training

In this phase of the project the dataset is divided into 20% and 80% model i.e. 20% of the data from the set is used to train the algorithm i.e. to create a base for the working of the project, the further implementation of the project will be carried out based on this 20% of data. This training phase is the most crucial phase for the project as the success rate of the project depends on this data.

Testing

After training phase is completed, the dataset and the inputs from the user can be tested to get the desired output. The greater number of testing is carried out by the algorithm the more accuracy will be increased. The testing accuracy of the input may differ for different algorithms, as the dependency of the data is more important on algorithm of the successful implementation and to get the desired output.

Experimental Analysis

Figure 3: Admin Login Page

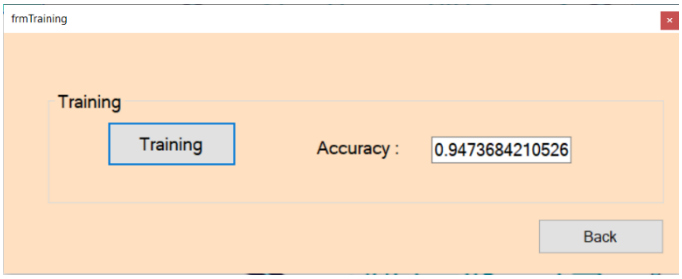

Figure 4: Accuracy of Trained Data

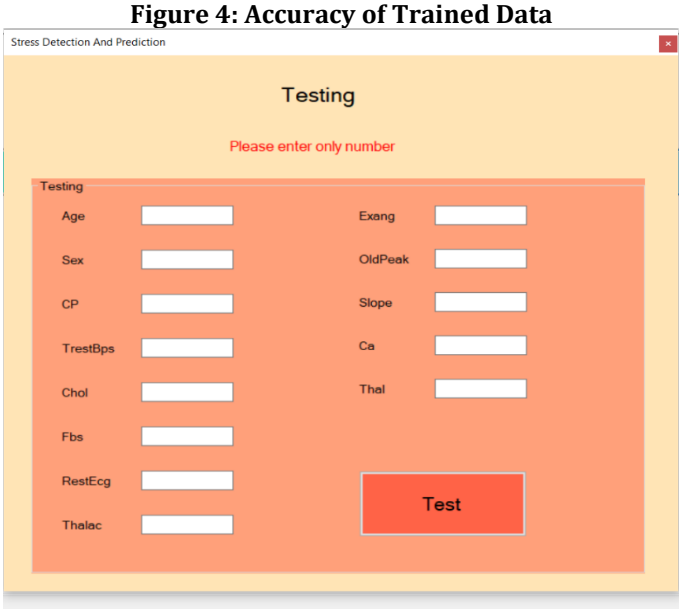

Figure 5: Testing Panel

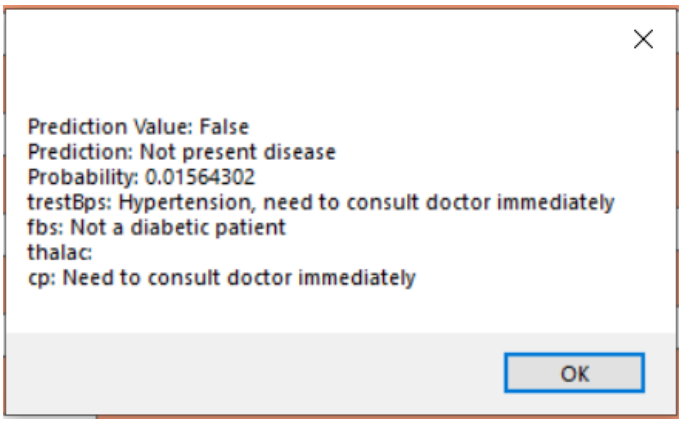

Figure 6: Output generated after testing

4. CONCLUSION

Electrocardiography can be best used to detect stress level. Current existing work identifies the stressed person and gives the output depending on the parameters and user input. By adding more parameters we can also identify some of the disease existing in person, the rise or decrease in any of the parameter may help us to detect whether the person is only in stress or is facing any sort of health issue too. Comparing various algorithm but depending on the accuracy only fast-tree regression algorithm is used.

REFERENCES

[1] Monika Chauhan, Shivani V. Vora, Dipak Dabhi, "Effective Stress Detection Using Physiological Parameters", 2017 International Conference on Innovation in Information, Embedded and communication Systems(ICIIECS).

[2] F. Mokhayeri, M-R. Akbarzadeh-T, S.Toosizadeh, "Mental stress Detection using Physiological Signals Based on Soft Computing Techniques", 14 December 2011.

[3] Healey, J. A., & Picard, R. W. (2005). Detecting Stress During Real-World Driving Tasks Using Physiological Sensors. IEEE Transactions on Intelligent Transportation Systems.

[4] Costin, R., Rotariu, C., & Pasarica, A. (2012). Mental stress detection using heart rate variability and morphologic variability of EeG signals. 2012 International Conference and Exposition on Electrical and Power Engineering.

[5] Akmandor, A. O., & Jha, N. K. (2017). Keep the Stress Away with SoDA: Stress Detection and Alleviation System. IEEE Transactions on Multi-Scale Computing Systems.

[6] Xing, Y., Rao, N., Miao, M., Li, Q., Li, Q., Chen, X., … Wu, J. (2019). Task-state heart rate variability parameterbased depression detection model and effect of therapy on the parameters. IEEE Access.

[7] Sioni, R., & Chittaro, L.(2015). Stress Detection Using Physiological Sensors. Computer.