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DETECTING STRESS IN PATIENTS WITH COMMUNICABLE DISEASES USING A DEEP LEARNING

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Abstract: Healthcare is a core of human's life. Being healthy is one of the main objectives of life ever since BC. Health is maintained and improved by the lifestyles, social, happiness and even willingness to live. Predicting a person's mood tomorrow, from data collected unobtrusively using wearable sensors and smartphones, could have a number of beneficial clinical applications; While accurately predicting mood and wellbeing could have a number of important clinical benefits, traditional Machine Learning (ML) methods frequently yield low performance in this domain. An integrated system to make human lives more easily and to help people in terms of mental health. The main objective of this project is to classify a new data and inform whether a person with stress is affected from acute stress or chronic stress. We will use the heart rate data taken for months and analyzes the data and find the Heart rate variance that constantly related with the stress. After that a variable is found, which is used as an input to the ensemble classifier which includes the Support Vector Machine (SVM), Decision Tree (DT) and Random Forest (RF) approaches. The best classifier will be selected by voting process.

I. INTRODUCTION

Mental stress is one of the major health problems in modern society, and can be defined as the body reaction to subjected psychosocial, physical, and biological stimuli. Stress involves the activation of hypothalamus-pituitary-adrenocortical (HPA) axis and sympathetic nervous system (SNS). The activation of HPA axis stimulates adrenal cortex to release glucocorticoids (cortisol), which plays an important role in the regulation of various physiological processes such as blood pressure, glucose levels, and carbohydrate metabolism. Chronic malfunction in SNS results in a variety of physical, immunological, and emotional health problems including anxiety, depression and post-traumatic stress disorder (PTSD), heart attack, stroke, and immunological disorders. Stress also affects the brain structure and functions. Several studies have reported that exposing to excessive stress could cause shrinkage of hippocampus. To prevent these, stress detection especially at its early stage is important for clinical intervention and disease prevention.

II. PHYSIOLOGICAL SIGNALS

One of the most prominent signals for discriminating stress is the heart activity because ANS influences the heart rate directly. The electrocardiogram (ECG) is employed to measure the electrical activity produced by the heart via electrodes placed on the body typically to the left arm, right arm and the left leg. A typical heart beat has four fundamental elements which are baseline, P wave, QRS complex and T wave. The most distinctive R peak is employed for feature extraction. Heart activity can be modelled with heart rate (HR), RR intervals (IBI) and heart rate variability (HRV). Heart rate variability is the oscillation of the time between consecutive beats. IBI interval can be defined as the time between two consecutive R peaks. All of these can be inferred from R peaks. The wearable devices that are used commonly for ECG measurement are Biopacs MP150, MP35 and Shimmer Sensing 3

III. BEHAVIOURAL DATA

Stress causes changes in the human voice generation mechanism. Pitch, speaking rate, energy and spectral characteristics are affected by stressful events. Speech is preferred by many researchers because it is non-invasive and data collection is easy in the controlled quiet environments. Pitch (mean, standard deviation, range), higher frequency bands ratio, speaking

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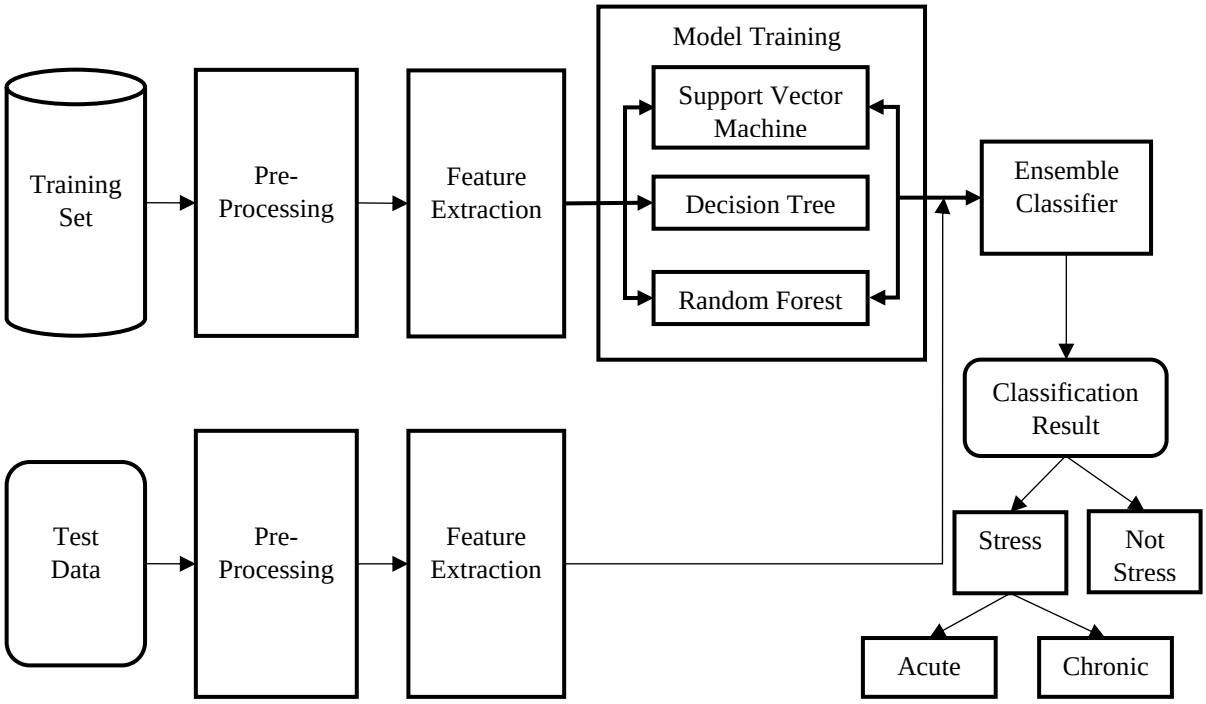
rate, voice intensity, smoothed energy, voiced unvoiced speech ratio, Mel Frequency Cepstral Coefficients (MFCC) are the features that are used widely to detect stress levels

Facial Expressions: Stress and emotional states have a correlation with facial expression. It has been demonstrated that facial expressions reflect emotions more than self-reports. Facial EMG and image recognition from cameras were used to detect facial expressions in stressful situations. Mean smile intensity, eyebrow activity and mouth activity are the main facial features for detecting stress.

IV. SYSTEM ARCHUTECTURE



Support Vector Machine (SVM)
A kernel-based machine, SVM, learns a family of methods used to accurately classify both linearly separable and linearly inseparable data. The SVM has been used in numerous machine learning fields, such as classification, regression estimation, and kernel principal component analysis, because it is capable of providing a good generalization capacity

Decision tree classifier (J48)
Decision tree is one of the most popular classification algorithms in machine learning. In this study, J48 classifier has been used for analysis. J48 classifier is written in Java and is an open-source implementation of C4.5 algorithm in WEKA tool. The selection of J48 is based on the fact that it is an improved version of ID3 algorithm. J48 is capable of efficiently handling both continuous and categorical attributes

Random forest classifier (RF)
Random forest is another decision tree kind of classifiers. It has been developed as an ensemble approach which is based on several decision trees. Random forest approach is based on a voting method

V. CONCLUSION

Heart rate can be measured from certain place such as chest, arms and neck. Heart rate can be related to the body's condition and mentality. Because heart rate can be changed very dynamically, data should be taken in a stable condition heart rate variance can be used to analyze the human body. Heart rate variance includes Time domain, frequency domain, poincare, non-linear and time frequency. For stress, MeanHR, MeanIBI, SDHR and SDIBI is the best variable from the available recorded data. Ensemble classifier can be used to successfully learn and classify data

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VI. FUTURE ENHANCEMENT

The proposed system can be enhanced by collecting other important parameters such as nationality of the users, age and gender to provide more specific predictions. Prediction will be more accurate with more data. Hence, in future, dataset will be increased in size so that why the obtained result can be used for healthcare application to enhance lifestyle of stress patients.

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