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STRESS DETECTION USING PHYSIOLOGICAL PARAMETERS

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ABSTRACT:

This paper presents a stress detection system utilizing fuzzy logic and two physiological signals: Galvanic Skin Response and Heart Rate. Unlike traditional methods offering a broad stress classification, this approach constructs individual stress templates by capturing individual behaviors across varying stress levels. The proposed method achieves a stress detection accuracy of 99.5%, validated with a dataset comprising 80 individuals. This performance surpasses existing literature approaches and prominent machine learning techniques such as SVM, naïve bayes algorithm and Linear Discriminant Analysis. Moreover, the proposed method is well-suited for real-time applications.

Keywords: Stress Detection, Physiological Signals, Support Vector Machine (SVM), naive bayes algorithm, Fuzzy Logic, Galvanic Skin Response, Heart Rate**.**

1.INTRODUCTION:

The goal of the health care system is to maintain both physical and emotional well-being by avoiding or treating disease through the use of available services. In day today life stress is the major cause of deaths in the world. The world health organization (WHO) has estimated that 12 million death occurred world wide, each year due to heart diseases. Over 80%of deaths in world are because of heart diseases. Who estimated in future, almost 23.6 million people will die due to heart diseases. The euro heart survey on stress was conducted by 25 countries it included adult switch moderate Prior valve interventions include infective endocarditis and serious native heart disorders. In 71.9% of the patients, stress was a native condition, and 28.1% had undergone prior intervention. Mean age was 64 to 14 years. Degenerative aetiologies where the most frequent in aortic stress and mitral regurgitation while most cause of mitral stenosis

Here of rheumatic origin. An significant part in intelligent medical health care systems has been played by data mining. Medical data mining in health care is regarded as an important yet complicated task that needs to be executed accurately and efficiently. Health care data mining makes an effort to address practical health issues with illness diagnosis and treatment. The heart disease prediction method can be used to assess the

relationship between illnesses, their true causes, and the impact of symptoms that patients experience on their own, is a computerized method for diagnosing stress based on prior data and information.

2. RELATED WORK

The word "heart disease" refers to a broad range of heart-related medical disorders. The anomalous health disorders that directly affect the heart and all of its components are described by these medical illnesses. Heart disease is a major health problem in today's time. This paper aims at analyzing the various data mining techniques introduced in recent years for heart disease prediction. Table 1 shows different data mining techniques used in the diagnosis of Heart disease over different Heart disease datasets. In some papers this is given that they use only one technique for diagnosis of heart disease as given in Shadab et al , Carlos et al etc. Nevertheless, in other research projects, as stated in Ms. Ishtake et al., MA. JABBAR et al., Shanta kumar et al., etc., multiple data mining techniques are employed for the identification of heart disease.

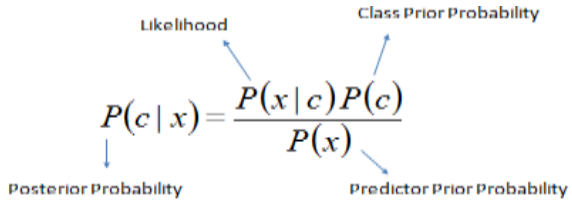
Table1: Table shows different datamining techniques used in the diagnosis of Heart disease over different Heart disease datasets

Author	Year	Technique used	Attributes
Dr. K. Usharani	2011	Clasification/Neural Networks	13
Jesminahar, etal	2013	Apriori/Predictive Apriori/Tertius	14
Latha, etal	2008	Genetic Algorithm/CANFIS	14
Majabber , etal	2011	Clustring/Association Rule	14
		Mining/Sequence number	
Ms. Lshtak , et al.	2013	Decision Tree/Neural Network/Naïve bayes	15
Nan-Chen, et al.	2012	(EVAR)/Machine Learning/Markov blanket	
Olegetal.	2012	ANN/Genetic Poliymorphisms	
Shadabetal	2012	Naivebayes	15
Shantakumar et al.	2009	MAFIA/Clustring/K-Means	13
Carlosetal	2001	AssociationRule	25

3. METHODOLOGY

Naive Bayes: Naive Bayes classifiers is a probabilistic classifiers based on applying Bayes' theorem with strong (naive) independence assumptions between the features. A Naive Bayesian model is easy to build, with no complicated iterative parameter estimation which makes it particularly useful in the field of medical science for diagnosing heart patients. The Naive Bayesian classifier is popular because it frequently outperforms more complex classification techniques, even if it is incredibly simple. Bayes theorem provides a way of calculating the posterior probability, P(c|x), from P(c), P(x), and P(x|c). Naive Bayes classifier assumes that the effect of the value of a predictor (x) on a given class (c) is independent of the values of other predictors. This assumption is called class conditional independence.

EQUATION



$$P(c \mid X) = P(x_1 \mid c) \times P(x_2 \mid c) \times \cdots \times P(x_n \mid c) \times P(c)$$

P(c|x) is the posterior probability of class(target) given predictor (attribute). P(c) is the prior probability of class. of predictor given class. P(x)is the prior probability of predictor.

Where C and X are two events (e.g. the probability that the train will arrive on time given that the weather is rainy). Such Naïve Bayes classifiers use the probability theory to find the most likely classification of an unseen (unclassified) instance . When the training set contains numerical data, the method performs poorly; nevertheless, it works well when dealing with categorical data.

4. DATA SET

The clinical data set used in this study was gathered from a top diabetic research facility in Chennai. It included information on around 500 patients. The definition of items relevant to diabetes is clear and precise in the clinical data set specification. The purpose of the diabetes data set is to give people with diabetes access to current information about their risk factors, current management, treatment goals and plans, and the results of routine surveillance for complications. This information will enable them to monitor their care and make well-informed management decisions. Additionally, it will guarantee that patients with diabetes receive consultations from medical specialists that are fully informed by thorough, accurate, and current information. Table 2 lists the diabetic attributes that our suggested system uses along with their descriptions.

Table2: Parameters of Heart Diseases Prediction System

Name	Type	Description
Age	Continuous	Age in years
Sex	Discrete	1= male 0=female
Cp	Discrete	Chest pain type: 1=typical angina 2=atypical angina 3=non-anginapa 4=asymptomatic
Trestbps	Continuous	Resting blood pressure (in mm Hg)
Chol	Discrete	Serum cholesterol in mg/dl
Fbs	Discrete	Fasting blood sugar> 120 mg/dl: 1= true 0=false
Restecg	Continuous	Resting electrocardiographic results: 0=normal 1=having ST-Twave abnormality 2=showing probable or define left ventricular hypertrophy by Estes‘criteria

Thalach	Discrete	Maximum heart rate achieved
Exang	Discrete	Exercise induced angina: 1= yes 0=no
Slope	Discrete	The slope of the peak exercise segment : 1 =up sloping 2=flat 3=down sloping
Slope	Discrete	The slope of the peak exercise segment : 1 =up sloping 2=flat 3=down sloping
Diagnosis	Discrete	Diagnosisclasses: 0 = healthy 1=possibleheart disease

5. DATA MINING TOOL

A set of machine learning algorithms for data mining applications is called Weka. The algorithms can be called from your own PYTHON code or applied straight to a dataset. Tools for pre-processing data, classification, regression, clustering, association rules, and visualization are all included in Weka. It works well for creating novel machine learning systems as well. The experiments are conducted using the weka tool and the results are obtained. We have used the naive bayes method to perform classification by using 70% of percentage split.

6. DATA ANALYSIS

The medical data set in this system is categorized according to the classes that are present or absent. The proposed naïve bayes model was able to classify 86.4198% of the input instances correctly and the incorrect instances was 13.5802% for 70% of percentage split. With the total of 81 instances70% was classified as correct and 11% instances was incorrect.

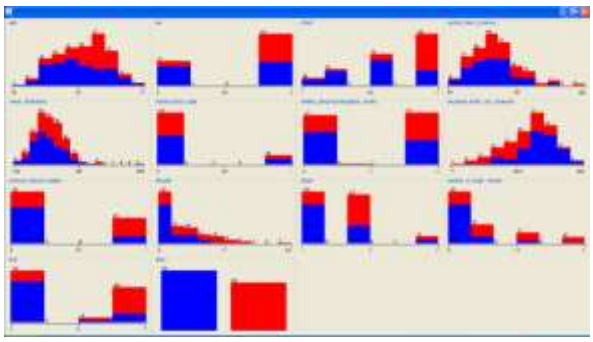


FIG 1: Attribute value distribution

The results clearly states that naive bayes heart diseases. he sections in Figure 1's graphs that are tinted blue indicate elevated cholesterol levels. From the graphs we can see that, most of the diabetic patients with high cholesterol values are in the age group of 45 – 55, have a body weight in the range of 60 – 71, have BP value of 148 or 230, have a Fasting value in therangeof102–135, have a P value in the range of 88 – 107, and have a A1C value in the range of 7.7 – 9.6.

7.RESULTS AND DISCUSSIONS

The results of our experimentation are shown inFig2. Fig. 3

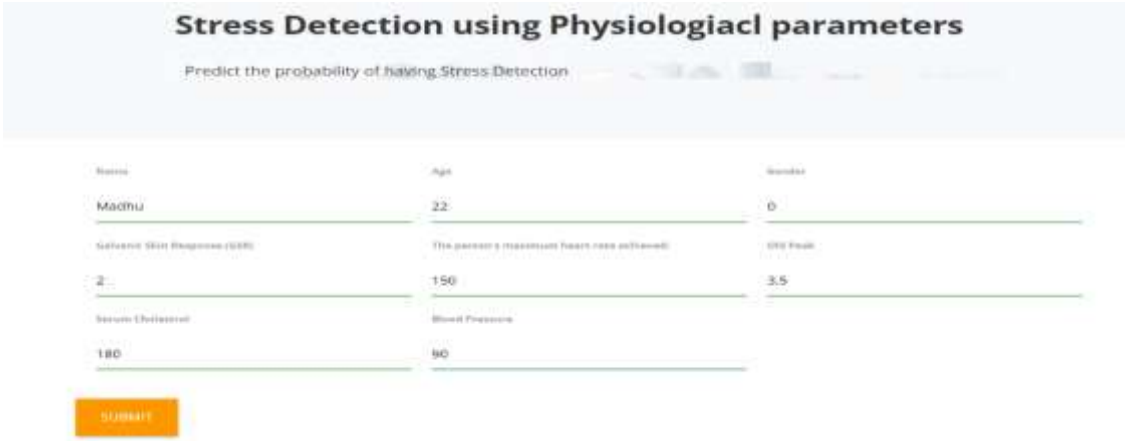


FIG 2: Result window of the data mining process

The proposed naive bayes model was able to classify 74% of the input instances correctly. It exhibited a precision of 71% in average, recall of 74% in average, and F-measure of 71.2% in average. The findings unequivocally demonstrate that, even when accounting for the fact that the characteristics analyzed are not precise markers of heart disease, the suggested approach outperforms other comparable approaches in the literature.

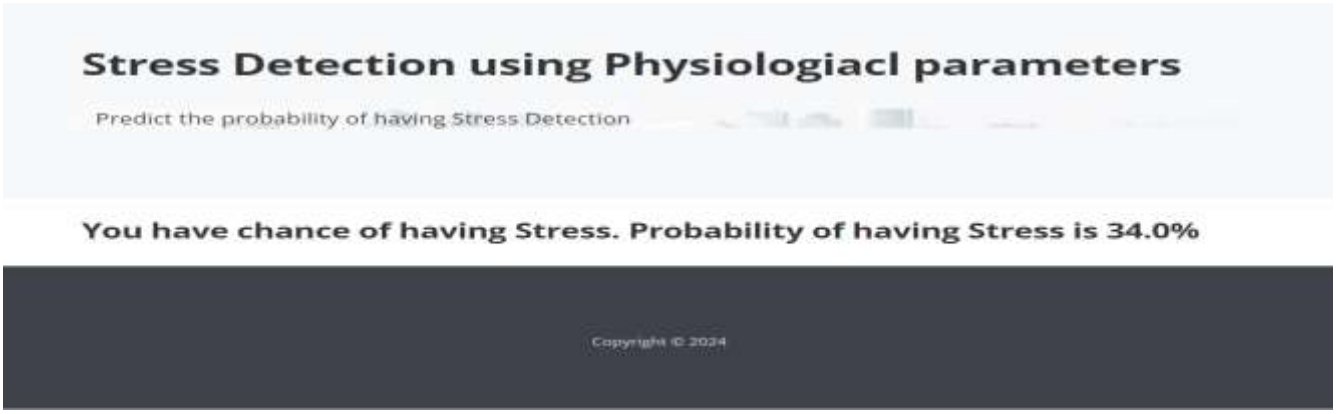


FIG 3: The output response of Stress Detection using Physiological Parameters.

8. CONCLUSION

In the medical field, data mining technologies are often utilized to diagnose cardiac patients and identify ailments based on the features and data set offered. Researchers are looking at using various data mining techniques to assist medical practitioners in diagnosing cardiac problems. In the proposed work naive bayes algorithm is used to classify the data set because naive bayes provides accurate results, with these results stress among people is predicted. Thus stress prediction system successfully diagnose the medical data and predicts the heart diseases. The results thus obtained shows that naive bayes algorithm provides 86.4198% of accuracy with minimum time.

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