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INTELLIGENT HEART DISEASE PREDICTING SYSTEM

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Abstract— The term "cardiovascular disease" is used to describe a variety of conditions that can have an effect on our hearts in today's society. Because it is such an important organ in our bodies, if it isn't working properly, it has the potential to either result in death or cause severe damage to other organs and tissues. In today's world, science and technology play an essential role in the field of healthcare. The prognosis of cardiovascular disease is a difficult task for practitioners to undertake because it calls for extensive training and an in-depth understanding. Even though there is a wealth of information that can be used in the healthcare industry, very little of it is actually being put to good use. The primary objective of this project is to design a prediction system that makes use of numerous data mining algorithms and neural networks to conduct an in-depth analysis of particular parameters in order to ascertain whether or not a particular individual is at risk for developing heart disease. The system assists in the diagnosis and management of illness by providing the user with information regarding the likelihood of developing a heart condition as well as providing the user with recommendations regarding preventative measures to take. The information will also be visualised by the system so that the user can gain a better understanding of the trends and patterns present in the data.

Index Terms— Heart disease, neural network, data mining, and prediction

I. INTRODUCTION

Neural networks and other data mining techniques can be applied to the abundance of information that is currently available in the medical field in order to have a greater impact on the decisions that are made. The decisions we make in our daily lives, combined with our genetic make-up, are the primary contributors to heart conditions. The Associated Chambers of Commerce and Industry of India (ASSOCHAM), one of the most prominent trade organisations in India, recently conducted a study on the prevalence of cardiovascular disease in the country. The study found that the number of cases of heart disease in the country has significantly increased over the course of the previous two decades. A sizeable proportion of the world's population has adopted a more unhealthy way of life, characterised by decreased physical activity, elevated levels of stress, and increased intake of foods high in saturated fats and tobacco products.

The process of medical diagnosis is an important one, but it is also a challenging one that requires precision and efficiency. The automation of this system is essential if medical professionals are going to be able to provide better diagnosis and treatment [2]. It is unacceptable to have poor clinical judgement, which can lead to outcomes that are devastating. It is possible for clinical judgments made by doctors to be inaccurate, which can lead to complications for their patients.

The quality of the service provided is the most important challenge that science and technology must overcome today. High-quality service must always begin with an accurate diagnosis of the disease and appropriate treatment of the patient. Neural networks are an essential component in the provision of high-quality medical services that are also information- and knowledge-dense due to this industry's heavy reliance on them.

II.A REVIEW OF THE LITERATURE

There are a lot of different classifiers that are investigated, and trials are done in order to find the one that is the most effective at identifying patients who have heart disease. A neural network is the most accurate diagnostic tool for determining which patients have coronary artery disease [1]. It is possible to make an accurate prediction of cardiovascular disease using neural networks when measurements such as blood pressure and sugar levels are included [2]. In order to determine which method of prediction is the most accurate, a comparison of the various data mining approaches that are used to predict heart disease using weights [3] is carried out. Fuzzy logic, evolutionary algorithms, and the capabilities of neural networks are all brought together in the CANFIS model [4].

A person's Body Mass Index (BMI) can be determined by taking into account both their height and weight. The following table provides information on how to determine whether or not a person is obese.

Table 2: Bad cholesterol

Types of weights	**Values**
Underweight	Less than 18.5
Normal	25.0-24.9
Overweight	25.0-29.9
Obese	Greater than 30.0

Bad cholesterol: In general total cholesterol level should be less than 200 mg/dl.

Table 3: Attributes

Bad cholesterol	**Cholesterol category**
Less than 100mg/dL	Optimal
100-129mg/dL	Near optimal
130-159mg/dL	Borderline high
190mg/dL and above	Very high

The history of the family: A history of heart disease running in one's family is an uncontrollable risk factor. The likelihood of having a heart attack or stroke increases if a first-degree blood relative, such as a father, mother, brother, or sister, has had one before the age of 55 (for a male relative) or 65 (for a female relative) (for a female relative).

III. CARDIOVASCULAR ILLNESSES

The human heart is the organ that plays the most important role in our bodies. It is generally agreed that it is the strongest muscle in the body. If your heart is not working the way it should, it will have a negative impact on the rest of your body. The beating of the heart forces blood into the left chambers of the heart, where it is then pumped into the body's arteries and capillaries. If a person's heart does not work as it should, they run the risk of developing cardiovascular disease. Having high blood pressure, diabetes, smoking cigarettes, and being under a lot of stress are all things that can interfere with the normal function of the heart. Having issues with how your heart functions increases your risk of developing heart disease.

One of the different kinds of heart disease is coronary heart disease.

The coronary artery disease that affects the most people around the world is also known as the most common form of heart disease (CAD). It is a condition in which plaque buildup restricts the coronary blood channels, thereby reducing the amount of blood and oxygen that reaches the heart. This condition is known as coronary artery disease (CAD).

2. The gina of the chest

It is a term that is used in the field of medicine to describe the discomfort in the chest that occurs when the heart does not receive an adequate supply of blood. Angina is another name for this warning sign of a possible impending heart attack. The time that passes without a bout of chest pain can range anywhere from a few seconds to several minutes.

3. disease of the enlarged heart

As a consequence of this illness, the heart is unable to pump an adequate amount of blood to the rest of the body. The term "cardiac failure" is often used to refer to this condition.

4. Cardiomyopathy

Because there is not enough cardiac pumping going on, the heart muscle either becomes weaker or goes through structural changes. There are a number of different factors that can lead to cardiomyopathy, such as high blood pressure, the consumption of alcohol, viral infections, and inherited defects.

IV. A DESCRIPTION OF HOW THE TARGET APPLICATION FUNCTIONS

NEURAL NETWORK is the first topic.

It is a subset of artificial intelligence that attempts to simulate the way in which the human brain works. It facilitates communication between the various processing components. The output of the neural network is affected by the organisation of the connections and the weighting of those connections. Neural networks are typically organised utilising layers. Each layer is composed of interconnecting nodes that have an activation function attached to them. Utilizing a wide range of activation functions allows the network to acquire new knowledge. The result of the activation function is passed on to the output layer, which is the layer that ultimately outputs the solution.

Layer 1: Input layer

At this level of the hierarchy, the network receives a variety of inputs. Each individual input is treated as its own distinct node. A weight is assigned to each individual node in the network.

Layer 2: Hidden layer

Through the use of weight connections, this layer is responsible for carrying out the actual processing. Processing operations are carried out by the activation function. It's possible that the hidden layer has 'n' number of nodes.

The output layer, or Layer 3

Attribute	Value
Age	Limit 18 and 70
Gender	Male, female
Weight	Actual value
Height	Actual value
Alcohol	True, false
Tobacco	True, false
Blood pressure	High , low, normal
Chest pain	True, false
Diabetes	True, false
Hypertension	True, false
Bad cholesterol	Actual value
Family history	True, false
Thyroid	True, false
Birth defect	True, false
Physically active	True, false

The output of the activation function is sent to the output layer, which then produces an output after receiving that output. There are two different pathways that information can take when travelling through a neural network. obtaining training and then finding work after obtaining training. While it is being trained, the network goes through a series of epochs in which it is being trained. If the desired output is not obtained after each training epoch, then the network is not considered to have been successfully trained; in this case, the weights of the nodes in the input layer will need to be updated once more.

When the network has learned everything it can, training will come to an end. Neural networks are able to acquire new information by employing a technique known as back propagation. It determines the amount of error by comparing the actual output of the network to the output that was desired. Because of the inaccurate information, weights are changed and then reapplied to the network. The primary objective of back propagation is to impart new information to the network. When the training phase is complete, the network is subjected to testing input, and the results are analysed.

Figure 1 is an illustration of the system architecture for the dataset obtained from the hospital and used to train the neural network. This dataset was obtained from the hospital. A neural network is the method that is utilised in order to ascertain whether or not a patient is at risk of developing heart disease. While the training dataset is utilised for the purpose of instructing the network, the testing dataset is utilised in order to ascertain whether or not the network is in fact producing the expected results. In the event that the algorithm returns a value of yes, it is presumed that the patient suffers from some form of cardiac disease, and the appropriate treatment will be administered. In the event that the patient does not already have heart disease, steps will be suggested to the patient to take in order to prevent it, and the patient will be informed of the likelihood that they will develop heart disease in the future.

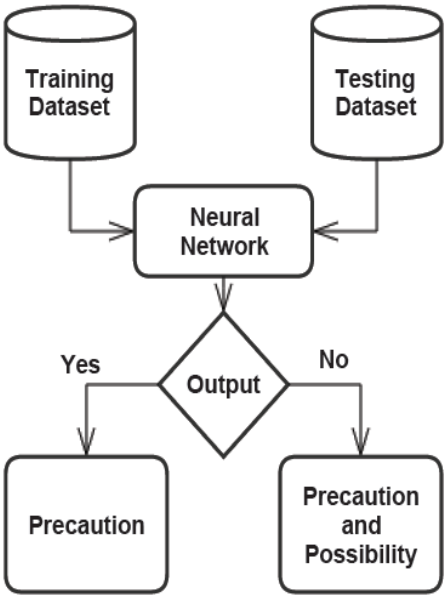

Fig. 1. System Architecture

A. COLLECTION OF DATA

The BSES hospital is the location where the data set for patients is collected. Only 15 characteristics from the database are factored into the predictions that are necessary for making a diagnosis of heart disease. The criteria that are used to make a determination include age, gender, weight, height, alcohol consumption, tobacco use, blood pressure, chest discomfort, diabetes, hypertension, bad cholesterol, family history, thyroid, birth defect, and level of physical activity. The parameters that were used and the possible values for those parameters are listed below.

B. TRAINING

Once it has been configured to predict heart disease, the neural network is prepared to be trained utilising training data once it has been set up. Utilizing supervised learning allows us to train the network that is a part of our system. The BSES MG Hospital was the location of the data collection for the training set. In addition to the necessary characteristics of the patient, the information also includes a determination of whether or not the patient suffers from cardiac disease. To begin, we will use weights chosen at random. Before comparing the computed result to the desired output, the network performs an analysis on the attributes that were provided by the user. The error is then spread throughout the system so that the weights can be adjusted to produce the outcome that is desired.

C. PARTICIPATION IN THE SYSTEM'S DEVELOPMENT

The user will have access to our website, which can be accessed online and will be made available to them. They are required to have a dependable internet connection in order to utilise the system. The individual who is interested in utilising the system must be aware of his fundamental information, such as his height (expressed in centimetres), weight (expressed in kilogrammes), the condition he is currently suffering from, as well as his family history. After successfully logging in, the user is obligated to provide all of the required information on the form before submitting it. The final product will consist of these three aspects:

1. A forecast of the result 2) Precautionary measures 3) The likelihood

1) Prediction: This refers to the process of determining whether or not a user has cardiac disease based on the information that they provide in the form. Predictions are made using statistical models. During the training phase of the neural network, the weights for each parameter are established and used to make predictions regarding the user's output.

2) Precaution: In the context of heart disease, the term "precaution" refers to preventative measures taken in advance. After precaution, one should engage in prediction. The user's way of life will heavily influence the appropriate precautions to take. The safety precautions will be modified according to the lifestyle choices made by the user. In the event that the user suffers from any serious conditions, he will be given preventative measures that are tailored to the conditions that he currently has.

3) Probability: If it is determined that the user does not currently have heart disease, the user will be told the probability that he will develop heart disease in the future. The likelihood will be determined based on the dataset that we have compiled as well as the activation function threshold value of the neural network. The data contained in the dataset will have a direct correlation with the degree of accuracy the possibility possesses.

V. CONCLUSION

Using the neural network method, our software will attempt to determine whether or not the user has a heart condition. The accuracy of the system is approximately 95%.

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